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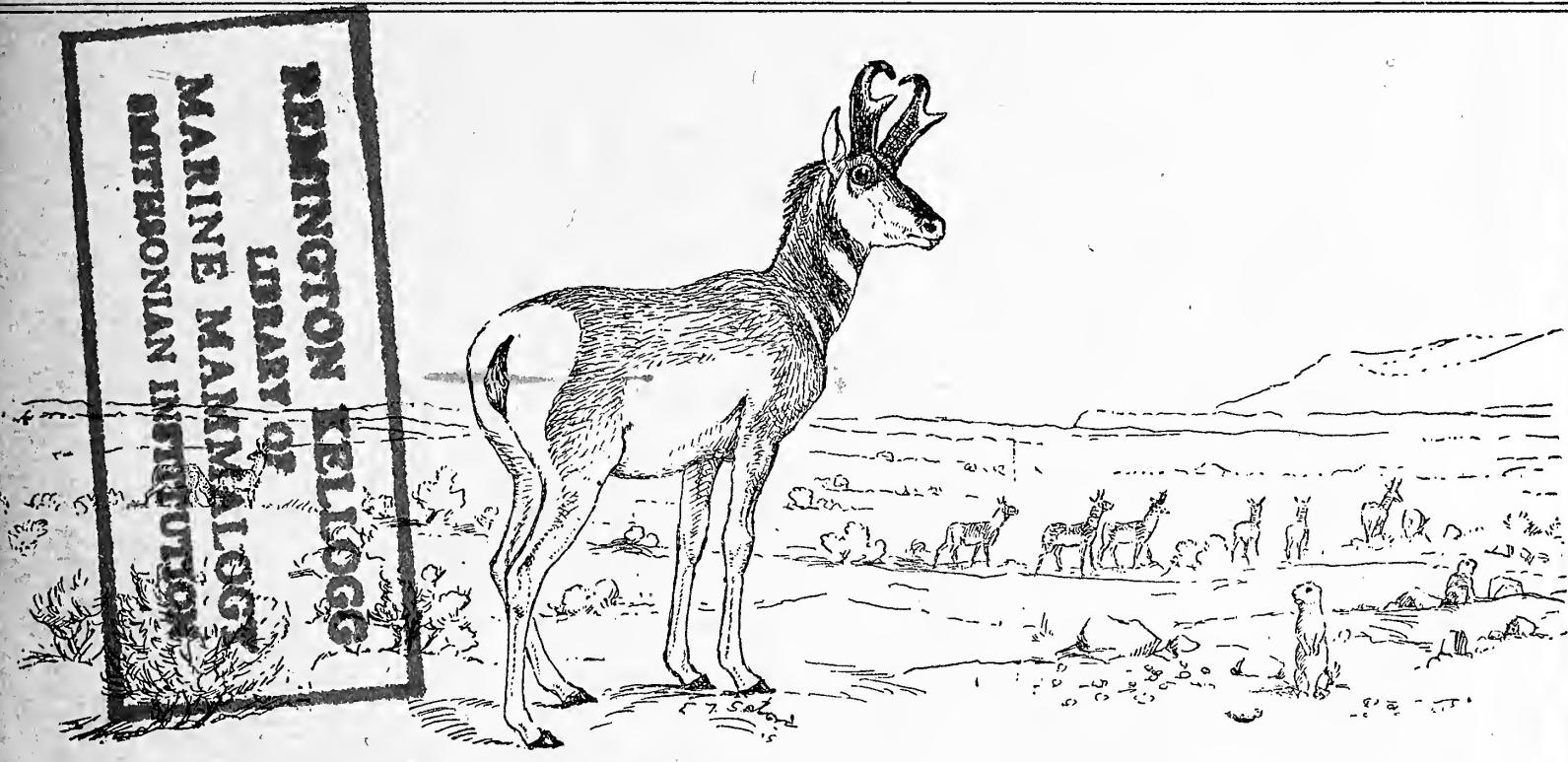
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JOURNAL OF MAMMALOGY

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VOL. I

NOVEMBER, 1919

No. 1

BATS FROM MOUNT WHITNEY, CALIFORNIA

BY GLOVER M. ALLEN

In July, 1915, it was the writer's privilege to accompany Prof. Theodore Lyman on a brief expedition to Mount Whitney, the highest peak in the United States outside of Alaska, lying near the southern end of the Sierra Nevada of California. Starting from Lone Pine, at the eastern foot, we ascended to the upper limit of timber and there camped for a week or more by the outlet of a mountain lake, at an altitude of about 11,000 feet. In successive evenings, four species of bats were secured at this camp, one of which proves to be an unsuspected new species, apparently related to *Myotis lucifugus*. The following brief notes are further offered as amplifying slightly the distributional data lately published by Mrs. Hilda W. Grinnell in her excellent Synopsis of the Bats of California (Univ. of Calif. Publ., zool., 1918, vol. 17, p. 223-404, pl. 14-24). All the specimens obtained were, through Doctor Lyman's generosity, given to the Museum of Comparative Zoölogy, at Cambridge, to the authorities of which I am indebted for permission to publish this report.

Myotis yumanensis sociabilis H. W. Grinnell

TEJON BAT

This form of the Yuma bat is characterized by Mrs. Grinnell as intermediate in color between typical *yumanensis* and its subspecies *saturatus*. She indicates its range as the "semi-arid Transition and Sonoran zones in [southern] California west and north of the south-eastern deserts." On July 16, a bat which seems referable to this race was shot just above our camp at 11,000 feet on Mount Whitney,

the highest recorded altitude for it in the state (though Mrs. Grinnell records one from 8500 feet in the San Bernardino Mountains). A second individual was captured at Lone Pine at the foot of the mountain, a few days later. Both are males.

In her Synopsis of the Bats of California, Mrs. Grinnell cites but a single specimen of typical *yumanensis* from that State, namely, one from Carroll Creek, Inyo County. In view of the implied distribution of this form east of the desert divides, I at first was inclined to refer the above specimens to it, but thanks to the generous interest of Mr. A. Brazier Howell, of Covina, California, I have been able to compare them with typical *yumanensis* from near Potholes, a short distance from Fort Yuma, Imperial County, the type locality. The skin from Mount Whitney is noticeably darker, with slightly darker membranes, thus inclining toward the race *saturatus*. There is a very notable difference, apparent in both skin and alcoholic, by which the two specimens from Inyo County are further distinguished, namely, the much larger thumbs with their longer, more curving claw. The thumb of typical *yumanensis* is nearly 1.5 to 2 mm. shorter, a difference very apparent on comparison. Although direct comparison with typical specimens of *sociabilis* has not been made, it is clear that our Mount Whitney and Lone Pine examples cannot be referred to *yumanensis* proper, and hence doubtless represent *sociabilis*, the subspecies intermediate in position between it and *saturatus*.

Myotis albicinctus sp. nov.

WHITE-EDGED BAT

Type.—An adult male, skin (and skull, temporarily mislaid), 11747 Mus. Comp. Zoöl., from 11,000 feet altitude at the upper limit of timber, Mount Whitney, California, July 14, 1915.

Characters.—A bat of the size and proportions of *M. lucifugus* but very pallid, with conspicuous white border to the wing membranes, broadest between the fifth finger and tarsus. Skull like that of *M. lucifugus* but the two small anterior premolars of the upper jaw relatively larger, the first drawn decidedly within the posterior border of the canine, by which it is thus partly concealed in side view.

Color.—The type is a very pale clear sandy above, nearest the “pale buff” of Ridgway’s 1912 Nomenclature of Colors, very slightly paler or grayer on the head; below clear and contrasting white, the gray bases of the hairs showing through on the throat. The basal portion of the fur of both surfaces is dark slaty, paler or grayish at the throat.

The ears are blackish as is also the greater part of the wing membranes. The posterior edge of the wing from the tip of the longest (third) digit to the ankle

has a pronounced white border, narrow at the tip of the wing and not sharply defined, but from the tip of the fifth finger to the tarsus, it is broad (1.5 mm. in the dry skin), very sharply and contrastingly marked off. The uropatagium is dusky on the basal third, passing into whitish on the distal two thirds, with a clearer white edge.

Membranes.—The ears and tragus are practically as in *M. lucifugus*, and minutely haired. The fur of the body extends very slightly on to the base of the uropatagium, but is sharply limited at the sides of the body. The foot is relatively large as in *M. lucifugus*, the calcar long and slender, unkeeled, ending in a minute projecting lobule. The extreme tip of the tail is free.

Skull.—Unfortunately the skull of the type has been temporarily mislaid. The skull of a second specimen, however, (1023, coll. of A. B. Howell) from Mono County, California corresponds closely in size and shape with that of *M. lucifugus altipetens*, but is at once distinguished by the relatively larger and blunter first and second upper premolars (pm^2 , pm^3). In *M. lucifugus* and its western race both are fully visible in side view, and stand practically in the line of the tooth row, the posterior tooth with perhaps one half the cross-section area of the anterior. In *M. albicinctus*, however, the larger anterior tooth is distinctly drawn in from the tooth row and shifted slightly forward, so that the anterior third of its base is nearly concealed by the base of the canine when viewed in profile. The second premolar is distinctly larger relatively, in cross section, than in *M. lucifugus*. As in the latter, and in contrast to *M. subulatus*, the lower incisors are but very slightly imbricate.

Measurements.—The type measured before skinning: total length, 86 mm.; tail, 42.5; hind foot, 9; ear from meatus, 15; forearm, 37; tibia (dry), 16. The specimen collected by Mr. A. B. Howell in Mono County, California, measured: total length, 91 mm.; tail, 41; hind foot, 11; ear, 14; alar expanse, 255. Its forearm measures 38 mm., tibia, 17.5.

The skull of the latter specimen (1023, coll. A. B. Howell), measures: greatest length, 15; basal length, 12.5; palatal length, 7; upper tooth row, i^1 to m^3 , 6.5; width outside m^3 , 5.8; interorbital width, 3.8; zygomatic width, 9; mastoid width, 7.5; lower tooth row, i_1 to m_3 , 7.

Remarks.—This very beautiful new species is at once distinguished from any of the described forms of North American *Myotis* by its pale buff coloration above, contrasting with the white lower surface, and by the conspicuous and sharply defined white border of the wing membranes, and the silvery uropatagium.

The type was shot at dusk as it was flying down the slope above our camp at 11,000 feet on Mount Whitney. The locality was just above a clump of pines that formed the upper limit of timber at the lower end of a large valley encroaching upon the main peak. A rushing mountain stream dashed past at this point and a large snow bank still remained near by in mid-July.

The skull of this specimen after brief examination, was put aside for cleaning but has been unfortunately mislaid. I had hesitated to de-

scribe the species without comparison of the skull, but the capture of a second example at Mammoth, Mono County, California, by Mr. A. Brazier Howell of Covina, California, has happily made this possible. Both Dr. and Mrs. Joseph Grinnell, who have seen these two skins, were inclined to refer them to *M. lucifugus altipetens*, though recognizing that they are quite different. Mr. Howell has very generously loaned me his specimen (taken on August 2, 1917) and it agrees in every essential with the type, showing the same pale buffy coloration above, pure white below, and conspicuous white border to the wing membrane. In the dry skin, the uropatagium is a trifle darker owing to its not being as completely spread. The beautifully prepared skull has made possible a description of the conspicuous difference in the upper premolars as compared with *M. lucifugus altipetens*, a specimen of which, identified by Doctor and Mrs. Grinnell, the Museum has from Mount Tallac, California. In size and details of external structure this species very closely resembles *M. lucifugus* and *M. l. altipetens* but in its coloration and in the relations of the first two upper premolars it is widely different and is unquestionably a wholly distinct species. As lately shown by Mrs. Grinnell, the race *altipetens* is clearly only a pallid subspecies of *Myotis lucifugus*, from which it chiefly differs in its tawnier coloration. The dark shoulder spot is a distinguishing mark of the species, but no trace of such a contrasting spot is found in *M. albicinctus*.

The pallid coloration of this bat may indicate that its main range is in the desert country chiefly east of the Sierras.

Myotis longicrus interior Miller

INTERIOR LONG-LEGGED BAT

Two males were shot on different evenings (July 14 and 17) at our camp at 11,000 feet. One is much darker in coloration than the other, apparently an immature though full-sized individual. The other is a brighter tawny-olive than a specimen from Hot Springs Pass, Mono County, in the Museum collection, taken as representing typical *longicrus*. I have followed Mrs. Grinnell in referring both to the subspecies *interior*. In her Synopsis of the Bats of California, she records it from the "arid Upper Sonoran, Transition, and lower Canadian zones" from Mono County southward. The present capture extends the limits of range to a record altitude. Our first specimen was shot shortly after sundown while it was flying about among

the tops of the pines surrounding the camp. The flight is rather slow and weak as compared with that of *M. lucifugus*. In addition to its longer tibia and smaller hind foot, this species is easily distinguished from the *lucifugus* group by its well-keeled calcar.

Eptesicus fuscus (Beauvois)

LARGE BROWN BAT

At our 11,000-foot camp, one or two large brown bats were seen nearly every evening, distinguished by their size and relatively slow steady flight. Of those shot only one, an adult male, was retrieved. It is quite identical in color with two females shot at Lone Pine, at the base of the mountain, and is not to be distinguished from eastern skins. Thus the wide geographical range of the species corresponds with its altitudinal distribution.

General remarks.—It is probably significant that all five specimens obtained at 11,000 feet on Mount Whitney, representing four species of bats, are males. The presence of *Myotis longicrus interior*, *M. yumanensis sociabilis*, and *Eptesicus fuscus* above the Transition or Lower Canadian zones appears to be unrecorded in California, yet all three were collected in what would be considered for ground-living mammals, a boreal (Hudsonian) zone. This wide range in altitudinal distribution implies a certain disregard for the zonal limits which is probably due to temporary increase in distributional area of insect life, causing a temporary invasion by bats from the lesser altitudes. As recorded by Mrs. Grinnell, of sixty-one bats of the race *Myotis yumanensis sociabilis* collected at Fort Tejon, July 21 to 25, all the adults were females, thus indicating, as Mrs. Grinnell suggests, "that with the approach of summer the full-grown [adult] males leave the colony and forage singly at higher elevations." That the breeding females are more strictly confined to their proper "life zones" seems likely and is corroborated by our observations on Mount Whitney, where the few specimens taken proved to be males. It is well known that the upper levels of mountains abound in insects, many of which are wafted up by convectional diurnal air currents from below, so that during the midsummer period they would form an attraction to insectivorous bats, and thus afford cause for a local and seasonal invasion by the non-breeding individuals. It was unexpected that we should not have taken *Myotis lucifugus altipetens* on Mount Whitney, a species whose normal range includes high altitudes.

CRITERIA FOR THE RECOGNITION OF SPECIES AND GENERA

By C. HART MERRIAM

In systematic work among animals and plants one is continually confronted by the theoretical question: what shall constitute the grounds for the segregation of forms into subspecies, species, subgenera, genera, and higher groups; and by the practical question of drawing dividing lines between the groups recognized. And in examining series of closely related species from different localities, one is often confronted by specimens that differ from the previously known forms, so that it becomes necessary to ascertain whether the observed peculiarities are genuine characters or merely individual variations. If they are exhibited by several specimens and it is known that these specimens came from the same area, the inference is that they represent a form worthy of recognition by name. And if the differences are comparatively slight—not of sufficient importance to be accorded full specific rank—it is customary to assume the existence of intergrades and call the form a geographic race or subspecies.

Dividing lines are now drawn much finer than formerly, and in many cases it is difficult to make up one's mind whether to treat a particular form as a species or a subspecies. When this has been decided, the result is usually published and the matter dismissed. But the next time the author has occasion to discuss the group, he is likely to find that his viewpoint has changed, or that additional specimens give the case a different aspect, so that the status of the form as previously published requires readjustment. The author himself may make the change, but if not, some other writer may be counted on to do it for him. In other words, irrespective of the *stability* or *worth* of the form, its RANK is subject to change. This may be due to information afforded by additional material, or to an altered point of view on the part of the author—for we must remember that after all we ourselves are the scales on which zoological characters are weighed, and that unhappily we have no 'Bureau of Standards' to adjust the balances of our judgment.

For guidance in deciding whether a form shall be treated as a full species or a subspecies, two diametrically opposite methods have been advocated—one based on the presence or absence of intergrades, the other on the degree of differentiation of the form in question. While

from the theoretical standpoint these methods are as far apart as possible, in practice they draw much nearer together. For in the great majority of cases of alleged intergradation the intergradation is *assumed* rather than *proved*, so that after all the student is influenced, albeit unconsciously, by the *quantity of difference*—this being in reality the determining factor in shaping his decision as to whether or not intergradation exists.

But in studying animals and plants, what difference does it make, (a) whether the worker has before him actual intergrades, or (b) whether the relationship between forms is so close that he feels justified in assuming intergradation, or (c) whether in fact at the present moment of the world's history intergradation does or does not exist? For is it not clear that in the course of evolution, intergrades, if not now present, must have existed in the past, so that their remains are likely to turn up at any moment? And is it not equally clear that if we are to destroy species and genera because of the presence of intergrades, it is only a matter of time before the discovery of living forms or the accumulation of paleontological evidence will lead to the abolition of a large proportion of our species and genera?

To my mind, the *criterion of intergradation* is one of the most pernicious that has ever been introduced into the systematic study of animals and plants and one necessarily productive of an ever-changing nomenclature. And furthermore, it has often resulted in bringing together forms between which intergradation has not only *not* been proved, but which in many cases never existed—the forms in question having arisen from a common ancestry in the distant past, rather than from one another under existing conditions. And even in the case of forms presumably derived from one another under existing conditions, what difference does it make whether the specimens at hand *prove* intergradation, or whether the closeness of their interrelationship *implies* that one is an offshoot of the other? *Is not the measure of relationship* of more consequence than the accident of survival or non-survival of intergrades?

In practice, neither the criterion of intergradation nor that of degree of divergence can claim immunity from the mistakes that come from the study of inadequate material, nor from those due to the idiosyncrasies of the personal equation, for until the arrival of the biological millennium personal opinion is likely to govern the existence or non-existence of intergrades and to stand in the way of agreement as to the measure of difference necessary to the recognition of species and genera.

In the case of errors resulting from inadequate material—the hovering demon of the systematic worker—no prophylactic treatment has yet been discovered, though experience and judgment count for much in lessening the frequency and severity of incorrect conclusions.

The history of the progress of ornithology and mammalogy in America proves that by the criterion of intergradation many forms have been described as subspecies that later proved to be either independent species or offshoots of species other than those to which they were originally referred, *showing that it is the practice of naturalists to assume intergradation rather than prove it.* The truth of this may be demonstrated by an examination of the published records of specimens examined, for while actual intergrades are often at hand, the record shows that in the great majority of cases the author did not see specimens from intermediate localities—the only localities from which intergrades could possibly have come.

W. H. Osgood, in his monographic *Revision of the Mice of the American genus Peromyscus*, had before him the unparalleled collections of the United States Biological Survey, supplemented by those of various museums and individuals, amounting in all to upwards of 27,000 specimens. In studying this astounding wealth of material, covering practically all parts of the North American continent, he naturally found a large number of intergrades, in connection with which circumstance he says: "Until recent years continuous and perfect intergradation was demonstrable only in relatively few cases. And even now, although proved beyond doubt in group after group, in many cases it is merely taken for granted." (N. Am. Fauna No. 28, p. 17, April, 1909.)

More than twenty years ago, after serving for a number of years as a member of the A. O. U. Committee on Nomenclature and Classification of North American Birds, I was so impressed by the inconsistencies, shiftings of rank, and illogical conclusions necessitated by the intergradation rule that I published in *Science* the following protest and suggestion:

In practice it has been found that only in a small percentage of cases does an author have at his command a sufficiently large series of specimens, from a sufficient number of well-selected localities, to enable him to say positively that related forms do or do not intergrade. The result of this obvious embarrassment is that authors usually exercise their individual judgment as to the *probable* existence or non-existence of intergradation, thus introducing the personal equation it was hoped to avoid. . . . It would seem therefore

that it would serve a more useful purpose if the terms species and subspecies were so used as to indicate *degree of difference*, rather than the author's opinion as to the existence or non-existence of intergrades. . . . In my judgment, forms which differ only slightly should rank as subspecies even if known not to intergrade, while forms which differ in definite, constant and easily recognized characters should rank as species even if known to intergrade.—*Science*, NS, V, pp. 753-758, May 14, 1897.

If the absence of intergrades in the hands of the student is the rule rather than the exception when dealing with *mainland forms of presumably continuous distribution*, what shall we say of closely related *insular forms* where the existence of intergrades is an obvious physical impossibility? And yet we all know that it is common practice—a practice in which I fully concur—to treat such forms as subspecies. Does not this demonstrate the absurdity of the intergradation rule? On the other hand, by adopting the criterion of degree of divergence, the imagination is not overtaxed, erroneous reference of subspecies to species from which they were not derived are rendered harmless, and the conclusions arrived at—usually the same as by the intergrade rule—may be stated without qualms of conscience.

To certain devotees of this rule, the discovery of intermediate forms seems to produce a psychologic shock, upsetting the judgment to such a degree that forms obviously entitled to recognition as full species are immediately degraded to the rank of subspecies.

The same is true of genera, for on the discovery of intermediate species, certain students feel impelled to bring together, under a single generic name, the members of two completely differentiated and easily recognizable genera.

And it may be added parenthetically that the same distorted point of view crops out here and there in the remote field of anthropology, some authors of distinction bringing together in a single linguistic family two or more strongly marked and perfectly distinct families because of the discovery (real or imagined) of an exceedingly remote ancestral relationship!

In these days of the universal acceptance of evolution, is it not hard to reconcile such reductions of groups with the facts that must be apparent to every one, for if species and genera and linguistic families are to be set aside because of the discovery of intermediate forms, does it not follow that sooner or later our classification is doomed to destruction, chaos taking the place of system?

THE MAMMALS OF SOUTHEASTERN WASHINGTON

BY LEE RAYMOND DICE

[Plates 1-2]

The distribution and habits of the mammals of southeastern Washington are known only from scattered references in papers dealing with other subjects. As a beginning in the organization of the knowledge on the mammals of the region, the following paper attempts to state, as completely as available data permit, the distribution of the various species of mammals occurring in Walla Walla and Columbia Counties. Original notes on the habits and abundance of the various species in this area are given. In addition any original notes at hand on the distribution or habits of the mammals of other parts of southeastern Washington are included. However, no attempt is made to give a complete statement of mammal distribution in other than the two counties named.

Descriptions of the climatic and topographic conditions in southeastern Washington have been given by Russell (1897) and Calkins (1905). Weaver (1917) has described the plant habitats of Whitman County, and the author (1915) has given descriptions of the vertebrate habitats in Walla Walla and Columbia Counties.

The mammals in the vicinity of Prescott, Walla Walla County, have been studied by the author at intervals between 1905 and 1917. In that time several successive years were spent in the region and frequent visits, often of several months' duration, were made, during which observations on mammals were taken whenever possible. Most of two years were spent at Pullman, Whitman County, and a number of observations were made in that region. Camping trips have been made at various times to Wallula, Lyon's Ferry, Wawawai, and the Blue Mountains. A considerable number of specimens have been secured, so that for the smaller species the identifications are well established. The specific identifications of the larger forms are based largely on their geographic distribution.

The taxonomic determinations of a number of specimens were kindly made by Dr. J. Grinnell, of the California Museum of Vertebrate Zoology, and others by Mr. Wilfred H. Osgood, of the Field Museum of Natural History, and by Mr. Vernon Bailey, of the United States Bureau of Biological Survey. A few notes by Mr. Floyd Ken-

dall, Ranger in the Wenaha National Forest, on the larger mammals of the Blue Mountains have been included. The illustrations are from original photographs by the author.

ANNOTATED LIST OF SPECIES

Scapanus orarius schefferi. Scheffer Mole.—Occurs at Walla Walla (Jackson, 1915, 63–64).

Sorex vagrans dobsoni. Dobson Shrew.—One was trapped June 15, 1914, in willows along the Walla Walla River three miles east of Wallula. In the Touchet Valley near Prescott numbers have been trapped in brushy places and in meadows. One was seen June 3, 1914, inside a building in Prescott. In the Blue Mountains one was trapped July 26, 1914, under a log in heavy lowland fir forest near Hompeg Falls. Between March 17 and May 27, 1909, several were trapped at Pullman in *Microtus* runways on top of the prairie hills and in swampy ground near Silver Lake, and one was taken in open brushy timber beside the South Palouse River.

Neosorex navigator navigator. Navigator Shrew.—One was trapped July 23, 1914, beside the Touchet River near Hompeg Falls. Another was taken August 8 in a small swamp beside Butte Creek.

Myotis longicrus. Long-legged Bat.—Small bats were numerous in flight during the evenings of early August, 1914, in the canyon of Butte Creek. One, which was shot, proves to be of this species. Larger bats, probably of a different species, were also seen.

Myotis yumanensis subsp. Bat.—Two specimens were taken in a building in the Touchet Valley two miles east of Prescott on August 20, 1915.

Myotis californicus californicus. Little California Bat.—One specimen is reported from Blue Creek in the Blue Mountains by Miller (1897, p. 71). On May 8, 1913, one was found under the window-sill of a house in the Touchet Valley two miles east of Prescott. This specimen is seemingly somewhat large for the subspecies. Bats are quite often seen flying in the evenings in openings in the trees in the Touchet Valley near Prescott. In late June, 1914, bats of several sizes were numerous flying over Snake River in the evenings at Lyon's Ferry, but none were secured.

Lasionycteris noctivagans. Silver-haired Bat.—A specimen taken at Walla Walla is in the collection of Whitman College.

Nycterus cinerea. Hoary Bat.—Miller (1897, p. 114) reports one specimen from Walla Walla. On the morning of September 14, 1915, another was found on the ground in a cornfield in the Touchet Valley two miles east of Prescott.

Ursus americanus altifrontalis. Black or Cinnamon Bear.—Reported to occur rather commonly throughout the Blue Mountains. Tracks were seen in early August, 1914, in Douglas spruce forest on the ridge near Twin Buttes Ranger Station, and in one place a freshly turned over log in western larch forest gave evidence of a bear's presence.

Canis latrans lestes. Mountain Coyote.—June 9, 1914, fresh signs were seen in the bunchgrass hills southeast of Wallula. June 13, one took a jack rabbit from a trap set in sagebrush east of Wallula. He ate the fore parts and buried the

remainder, returning the next day to the cache. A number of coyotes are trapped in the winter in the region and they are reported very abundant. In the bunchgrass hills of Walla Walla and Columbia Counties they are common, and may sometimes be seen in the open parts of the Touchet Valley, though they do not often go into the timber. They are reported to occur in the Blue Mountains.

Vulpes sp. Red Fox.—Reported to occur rather commonly on the ridges of the Blue Mountains. In July and August, 1914, a number of tracks were seen along the trails on the ridges in burnt-over areas and in low brush.

Procyon psora pacifica. Pacific Raccoon.—Reported to occur along the Walla Walla River near Wallula. A few occur along the Touchet River in the neighborhood of Prescott. They are occasionally noted in the timber along the stream and their tracks are sometimes seen along the river bars. In late June, 1914, raccoons were reported to be causing considerable damage to poultry at Lyon's Ferry, and a number of fresh tracks were seen in the soft mud along the margin of Snake River.

Martes sp. Marten.—Mr. Floyd Kendall reports that martens occur in the canyons of the Blue Mountains.

Mustela cicognanii lepta. Weasel.—A young specimen was taken August 7, 1914, in heavy brush along Butte Creek.

Mustela arizonensis. Mountain Weasel.—The skull of a female from Prescott is smaller and relatively shorter and broader than skulls from the Sierras of California, but otherwise the specimen is typical. Mountain weasels occur quite frequently in the neighborhood of Prescott. They range over the bunchgrass hills, but are much more abundant near brush and timber in the Touchet Valley. They have been taken in traps set at the openings to the tunnels of the Columbian ground squirrels and in the burrows of pocket gophers. Occasionally they cause damage in poultry yards. A female taken June 5, 1913, at Prescott contained no embryos.

Mustela vison energumenos. Pacific Mink.—A few occur along the Touchet River near Prescott. They wander out into the timbered parts of the valley and occasionally visit poultry yards. Mr. Floyd Kendall reports that they occur along the streams in the Blue Mountains.

Mephitis occidentalis major. Great Basin Skunk.—Howell (1901, p. 36) notes a specimen from Touchet. They are reported to be quite numerous in the timber along the Walla Walla River east of Wallula. A few live in the brush and timber along the Touchet River near Prescott; and they have been trapped in the prairie hills over a mile from the river. At Lyon's Ferry a number occur along the shores of Snake River.

Taxidea taxus neglecta. California Badger.—Badger mounds were numerous in June, 1914, in the sagebrush near Wallula, but they were still more abundant in the bunchgrass hills to the southward. On Eureka Flat they were numerous in both sagebrush and in bunchgrass. Numbers occur throughout the bunchgrass region of Walla Walla and Columbia Counties. In the Blue Mountains a few occur on the ridges in open places and among the low bushes. On June 10, 1914, about 7 a.m., a group of four badgers were seen hunting in sagebrush three miles east of Wallula. They all seemed to be about the same size, and this was probably a family party returning from a hunt. They kept close together and moved at a slow trot, exploring the ground carefully, with nervous movements.

Finally they all went into a group of badger holes near a small ravine, two individuals going into the same hole. Several remained for some time at the mouths of the burrows to watch me, as they seemed to be very curious, but soon all retired and were not again seen. They seemed to be able to travel backward equally well as forward, and when only several feet from a burrow they nearly always backed toward and down into it. Every one seemed to go into the burrow backward.

Felis oregonensis hippolestes. Rocky Mountain Puma.—Mr. Floyd Kendall reports that pumas are rare in the Blue Mountains.

Lynx rufus subsp. Lynx.—A few are reported to occur along the Walla Walla River east of Wallula. Tracks in snow were seen December 25, 1908, in the timber along the Touchet River two miles east of Prescott. In late July, 1914, a number of tracks were seen in alpine fir forest on the ridge at the head of the North Fork of the Touchet River, and a few in burnt-over and brushy places on the ridges near Twin Buttes Ranger Station.

Onychomys leucogaster fuscogriseus. Gray Grasshopper Mouse.—Hollister (1914, p. 444) records two specimens from Touchet. On June 12, 1914, one was trapped in sagebrush near the top of a small wind-eroded bluff at the edge of the valley of the Walla Walla River three miles east of Wallula. Extensive trapping in the same locality failed to secure any other specimens.

Reithrodontomys megalotis nigrescens. Dusky Harvest Mouse.—In early June, 1914, numbers were trapped in the willows along the Walla Walla River three miles east of Wallula. One was taken on June 16 at the head of a ravine in the bunchgrass hills south of the same locality. Along the Touchet River east of Prescott they are abundant in brushy places and in meadows. One was found in a stubble field a half-mile from the river on December 24, 1908. Half-grown young were taken at Prescott in 1913 as early as April 10, and individuals still immature were taken in the latter part of July, 1914. Captives kept in large boxes did not eat raw potatoes, but were fond of dry oatmeal and wheat. Several half-grown young partly ate one of their number which died. In the summer of 1915 signs of mice were noted in a deserted bird's nest about five feet above ground in an arbor vitae shrub growing in a garden near Prescott. A trap was set and an adult male harvest mouse secured on July 9. The bird's nest apparently was used as a resting place by the mouse.

Peromyscus maniculatus gambelii. Gambel White-footed Mouse.—In the early part of June, 1914, eleven white-footed mice were trapped in the willows along the Walla Walla River three miles east of Wallula. Several were taken on June 14 in sagebrush not over 200 yards from an irrigating ditch near the same place, but the species does not form a part of the typical sagebrush association. One was taken June 16 from a line of 10 traps set among the rocks on a hillside in the range of hills to the south. In the neighborhood of Prescott the species is common in the timber along the Touchet River. They are sometimes found in houses and barns. A few live in the bunchgrass covered hills and they have been taken over a mile and a half from the nearest water. At Lyon's Ferry two were taken on June 25, 1914, in traps set about driftwood and rocks along the shores of Snake River, and a number were taken at the bases of the basaltic cliffs and on rocky slopes. In the Blue Mountains in the summer of 1914 white-footed mice were taken in every land habitat where trapping was done. At

Hompeg Falls they were taken in lowland fir forest, in western larch forest, in yellow pine forest, and on rocky slopes. They were less common in heavy forest than in the more open brushy places and were very abundant on the rocky slopes, especially near low shrubs. On the high ridges between the Touchet and Wenaha Rivers white-footed mice were taken in alpine fir forest, in western larch forest, in Douglas spruce forest, and in buckbrush. In the canyon of Butte Creek several were trapped in the brush and timber along the stream.

A female white-footed mouse heavy with young was taken March 27, 1908, in the bunchgrass hills near Prescott. A fully grown subadult male was taken May 24, 1914, in a farm building in the Touchet Valley east of Prescott. One old female taken on July 2, 1914, in the brush along the Touchet River near the same place contained four large embryos; another contained a mass of unformed embryos; while a third contained no embryos. Of two young females taken at the same time and place one contained four and the other five medium-sized embryos. On July 8, 1915, a nest containing the mother and five half-grown young was found in a building at this locality. The nest was constructed of small bits of cardboard, paper, sacks, cloth, and a few chicken feathers. The bottom of the nest contained much excreta. On September 13, 1909, a female taken in a stubble field in the Touchet Valley near Prescott contained two large embryos. Evidently these mice breed at least twice in each season in this region, and the females may breed in the same season in which they are born. Of fourteen females examined in the Blue Mountains between July 22 and 26, 1914, none contained embryos.

A captive subadult male studied at Prescott during the latter part of May, 1914, elaborated a nest from cotton placed in the box. He readily ate rolled oats and nibbled at a raw potato. In eating small objects the body was supported on the hind legs and the fore feet used to handle the food and present it to the mouth.

Peromyscus maniculatus artemisiæ. Sagebrush White-footed Mouse.—Common at Pullman on the prairie hills, about rocks, in cultivated fields and orchards, in meadows, and in the brush and timber along streams.

Neotoma cinerea occidentalis. Western Bushy-tailed Wood Rat.—Reported to be common about houses along the Walla Walla River east of Wallula; a young one taken in a cellar was seen on June 10, 1914. A nest was found June 15 under a large rock in a ravine at the base of the hills southeast of Wallula. One was trapped in 1893 in a cellar in the prairie hills two miles southwest of Prescott; another was taken in 1910 in the cellar of a house beside the Touchet River two miles east of Prescott; these animals lived in burrows dug in the soft dirt walls of the cellars. In the Blue Mountains wood rats are reported to be numerous about cabins.

Evotomys gapperi saturatus. Dusky Red-backed Mouse.—Two were trapped in the summer of 1914 in lowland fir forest in the canyon near Hompeg Falls; on the ridges between the Touchet and Wenaha Rivers one was taken in thick buckbrush, one in western larch forest, and two in alpine fir forest in a small cove near the top of the ridge; along Butte Creek one was taken in a swampy place and one in the brush and timber along the stream.

Microtus nanus canescens. Gray Meadow Mouse.—Numerous in the meadows and in brushy places along the Touchet River near Prescott. They do not seem

to wander far from water. Bailey (1900, p. 31) reports one specimen from Fort Walla Walla. At Pullman their runways are common in the grassland of the tops and slopes of the hills. April 1, 1913, a female with eight very small embryos was taken in brush beside the Touchet River near Prescott. April 6 another female caught in an alfalfa meadow contained six well-developed embryos each about 22 mm. in length. Half-grown young were common as early as April 1 in that year.

April 6, 1913, a set of workings of this species in an alfalfa meadow near Prescott was dug out. Fresh surface runways extended in several directions 1 to 3 meters from a group of three holes which were not over 50 cm. from each other. The three holes were the openings to three tunnels which connected together near the underground opening to a fresh nest. The nest was composed of dried grasses and its top was several centimeters below the surface of the ground. The passages were fairly intricate, but not long, and in a blind alley a female heavy with young was found. The previous day a large male had been trapped near the entrance to one of the tunnels. As this system of workings was at least 50 meters from any other group of workings the evidence is strong that it was constructed and occupied by a single pair of mice. In a set of tunnels beside an old fence, partly dug out on April 13, one tunnel ran underground for more than four meters and had several branches. A fresh underground nest filthy with excreta connected with the tunnel. A young individual was captured in the tunnel.

Captives are very fond of raw potatoes and also eat oatmeal and to a slight extent grains of wheat.

Microtus mordax mordax. Biting Meadow Mouse.—Very abundant in the first week of August, 1914, in brush and timber and especially in swampy places along Butte Creek. On July 28 one was trapped in alpine fir forest on the top of a ridge at the head of the North Fork of the Touchet River. On August 9 two half-grown young were trapped in brush beside a spring on the ridge at Twin Buttes Ranger Station. A female taken on Butte Creek August 5 contained two large embryos nearly ready for birth. Half-grown young were numerous at the same place on that date. Three were trapped in late May, 1909, in brush along the South Palouse River at Pullman.

Ondatra zibethica osoyoosensis. Rocky Mountain Muskrat.—Hollister (1911, p. 36) records specimens from Touchet and from Walla Walla. On June 15, 1914, one was seen swimming in the Walla Walla River three miles east of Wallula. A considerable number occur along the Touchet River near Prescott. At Pullman a few occur along the South Palouse River and in Silver Lake.

Rattus norvegicus. Norway Rat.—House rats have entered southeastern Washington and are rapidly increasing in numbers. They are common in Walla Walla and a few occur in Prescott, and they are spreading along the valleys.

Mus musculus musculus. House Mouse.—On June 13 and 14, 1914, ten were trapped in the willows along the Walla Walla River three miles east of Wallula. In the neighborhood of Prescott they are abundant about the houses in town and in the valley, and even about farm buildings far out in the bunchgrass hills. In the Touchet Valley they are often found about grain stacks and in the timber and brush along the river. One was taken May 29, 1909, in brush by the South Palouse River at Pullman.

Thomomys columbianus. Columbian Pocket Gopher.—Two specimens were taken in June, 1914, in the meadows at the edges of the willows along the Walla Walla River east of Wallula, and mounds were numerous at this place. A few mounds were also observed in sagebrush on the lower slopes of the hills to the south. Pocket gophers occur sparingly in the prairie hills near Prescott, but they are much more abundant in the meadows and orchards along the Touchet River. They occur in open timber, but only very rarely under heavy shade. In an alfalfa meadow of about ten acres 75 gophers were trapped in the spring of 1913.

Gophers are active more or less all winter near Prescott, but there is a great increase of activity in the spring, as is shown by the number of fresh mounds thrown up at that time. In 1913 the increase of activity was very apparent in the early part of March. Seemingly, the males become active in spring several weeks before the females; during March and the early part of April, 1913, nearly all those taken were males. Gophers seem to breed early in the vicinity of Prescott. In 1913 small animals from one-half to three-fourths grown were common in the latter part of March and in April. One female taken April 5, 1913, contained a mass of unformed embryos. April 29 a female was taken in the same burrow from which a male had been taken a few days previously. On April 29 in another burrow a fresh nest was found. This nest was made of grass and alfalfa leaves, some of which were still green. The nest, which had only one entrance, was about 8 inches below the surface of the ground and was about 2 feet from the nearest mound.

Thomomys fuscus fuscus. Brown Pocket Gopher.—Numerous all over the Blue Mountains. Near Hompeg Falls they were abundant from the bottoms of the canyons to the tops of the ridges, occurring even in very rocky ground. They were abundant on rocky slopes and in yellow pine forest. A few occurred also in lowland fir forest in the bottom of the canyon under quite heavy shade. In dry places on the higher ridges of the mountains they were common in open ground, in brush, in alpine fir forest, and in western larch forest. At Pullman they are common in the valleys and on the prairie hills.

Perognathus parvus parvus. Oregon Pocket Mouse.—The skulls of pocket mice taken at Wallula have smaller bullæ than those of *Perognathus l. lordi* from Okanagan, British Columbia, or from Prescott, Washington, and cannot then be referred to *P. l. columbianus*, which is stated by Osgood (1900, p. 40) to have larger bullæ and mastoids than *lordini*. These specimens agree with the description of *parvus* and are referred to that form. The pelage is lighter in color than that of *lordini*.

A considerable number of pocket mice were taken in sagebrush near the Walla Walla River three miles east of Wallula during June, 1914. They occurred both in areas of drifting sand and in areas of packed sand. One was trapped in bunchgrass on top of the hills to the south. All seem to be of the same species. These mice are sometimes active during the day as is shown by tracks on wind-blown sand. The cheek pouches often contain seeds of grasses and of other plants. A female taken June 10 contained four rather large embryos.

Perognathus lordi lordi. Northwest Pocket Mouse.—Common in the bunchgrass areas and grain fields of the region about Prescott. Although they occur in the open parts of the Touchet Valley none have been taken near timber or brush. A female taken near Prescott July 7, 1914, contained eight small



FIG. 1



FIG. 2

(Dice: Mammals of Southeastern Washington.)



FIG. 1



FIG. 2

(Dice: Mammals of Southeastern Washington.)

PRELIMINARY NOTES ON AFRICAN CARNIVORA

BY J. A. ALLEN

The purpose of these notes is to secure early record for certain results obtained in a study of some 600 specimens of African Carnivora collected by the American Museum of Natural History Expedition in Belgian Congo during the years 1909–1915, under the leadership of Herbert Lang and James P. Chapin of the scientific staff of the Museum, as the final report, now practically finished, will be delayed in publication. These notes relate in part to some of the more interesting of the new forms thus disclosed and in part to questions of taxonomy and nomenclature. The full report will include numerous illustrations, from pen drawings, of the cranial and external characters of not only the new forms but also of the principal generic types of the Viverrinæ and Herpestinæ represented, and numerous reproductions of field photographs of specimens in life or in the flesh, and photographs from skins illustrating individual color variation, for which large series of specimens from single localities afford abundant material.

These preliminary notes are here published with the approval of the American Museum authorities. The full report will form part of Volume XLII of the Museum *Bulletin* which will be exclusively devoted to the Congo collection of mammals. The first part of this volume, containing the report on the Insectivora, is already in press.

Genus *Aonyx* Lesson

Lutra (part) most authors prior to 1900.

Aonyx LESSON, Man. de Mammalogie, 1827, p. 157. Type, by monotypy, *Aonyx delalandi* Lesson (1827) = *Lutra inunguis* F. Cuvier (1823) = *Lutra capensis* Schinz (1821).

Anahyster MURRAY, Proc. Roy. Phys. Soc. Edinburgh, II, 1860, p. 157. Type, by monotypy, *Anahyster calabarica* Murray, sp. nov., from Old Calabar, West Africa. GRAY, Proc. Zool. Soc. London, 1865, p. 129. (As a subgenus of *Aonyx*; restricted to the clawless otters of Africa.)

Aonyx (part) GRAY, Proc. Zool. Soc. London, 1865, p. 129. (Restricted to the Indian clawless otters.) THOMAS, Ann. Mag. Nat. Hist. (8), I, 1908, p. 387. (Part; includes both the African and Indian species.)

The genus *Aonyx* Lesson was exclusively based on the so-called clawless otter of the Cape region of South Africa (*Lutra capensis* Schinz, renamed *Aonyx delalandi* by Lesson), of which the genus *Anahyster* Murray, based on a clawless otter from Old Calabar, is a synonym.

Notwithstanding the great specialization of its type, *Aonyx* did not receive general recognition as a genus till the present century. J. E. Gray, in 1865 and later, recognized *Aonyx* as a full genus, but he combined with the *Aonyx capensis* group the clawless otters of southern Asia. More than this, he divided *Aonyx*, as he recognized it, into two groups, and wrongly assigned his restricted *Aonyx* to the Asiatic species and adopted *Anahyster* for the African species, the only species originally included in *Aonyx*.

Lesson, the founder of *Aonyx*, proposed *Leptonyx* in 1842,¹ for the clawless otters of Asia, a name unfortunately doubly preoccupied, first for a genus of birds (Swainson 1821) and later for a genus of seals (Gray 1837). Both groups are entitled to full generic acceptance, according to standard modern opinion as to what constitute generic differences among mammals. *Aonyx*, however, has hitherto stood for both groups, whenever used in either a generic or a subgeneric sense.

While the foot structure of the clawless otters of Africa and the small-clawed otters of Asia is similar, the external and cranial characters, including the dentition, are widely different in the two groups. Yet the clawless Asiatic otters have been, and are still, referred to *Aonyx*, when not placed in *Lutra*, and, with one exception, all the figures that I have seen purporting to give the cranial and dental characters of *Aonyx* have been based on the skulls of Asiatic forms. Hence a non-typical and, from my viewpoint, a non-congeneric form not originally included in the genus has been taken to typify *Aonyx*, so far as the literature of the group is concerned.²

Micraonyx nom. nov.

Leptonyx (subgenus of *Lutra*) LESSON, Nouv. Tableau Règne Animal, Mamm., 1842, p. 72. Type, by tautonymy, *Lutra leptonyx* Horsfield = *Lutra cinerea* Illiger.

The name *Leptonyx* is preoccupied by *Leptonyx* Swainson (1821) for a genus of birds, and by *Leptonyx* Gray (1837) for a genus of seals. It is here replaced by *Micraonyx*.

While the external differences are by no means insignificant, those of the skull and teeth are such as most taxonomers consider as of high

¹ Nouv. Tableau Règne Anim., Mamm., 1842, p. 72.

² See, for example, the well-known figure in Flower and Lydekker's 'Mammals Living and Extinct,' 1891, p. 568, fig. 261, "of the palate of *Lutra cinerea*," reproduced from 'Palæontologia India.'

importance. Some of these differences have not escaped record, but this fact has not directed to them the attention they deserve. While at first glance the skulls of *Aonyx* and *Micraonyx* appear to have many features in common, they differ greatly in proportions and in the relative size of corresponding teeth. In *Aonyx* the antorbital portion of the skull is heavily developed, being broad, with large incisors and canines, while the carnassials and molars are only moderately developed in proportion to the size of the skull; all these conditions are reversed in *Micraonyx*. In the latter the facial portion of the skull is narrow and weak, with small incisors and canines, while the carnassials and molars are enormously developed for the size of the skull, these teeth about equalling those of *Aonyx*, which has a skull fully three times the bulk of the skull of *Micraonyx*. This creates a vast difference in the relative breadth of the palatal space between the carnassials and molars of the maxillary series, which in *Micraonyx* is much less than the transverse breadth of m^1 , while in *Aonyx* this space is one and a half times greater than the transverse breadth of m^1 .

*Osbornictis*³ gen. nov.

Type, *Osbornictus piscivora* sp. nov.

Skull long and lightly built; teeth small, especially the carnassials and upper molars, with correlated size reduction in all the other teeth. Sagittal and lambdoid crests and postorbital processes highly developed. Rhinarium small, without a median sulcus. Soles and palms bare, not furred as in *Genetta* and allied genera. Color of body uniform red; tail black; head-markings white; wholly without the black spots and bands so characteristic of the other Viverinæ. Habits piscivorous.

Osbornictis is most nearly related to *Genetta*, from which however it strikingly differs. It requires comparison with no other genus. The type agrees closely in size with *Genetta victoriæ*, the largest of the genets.

Osbornictis piscivora sp. nov.

Type, No. 51514, ♂ ad., Niapu, Belgian Congo, December 1, 1913; Herbert Lang and James P. Chapin, American Museum Congo Expedition. Orig. No. 2147. Skin and complete skeleton.

³ Named for Professor Henry Fairfield Osborn, President of the American Museum of Natural History, whose deep interest in the American Museum Congo Expedition contributed greatly to its success in the field and later toward the early publication of its scientific results.

External measurements about as in *Genetta vistoriae* Thomas, but soles and palms naked, and coloration radically different; skull slender, dentition weak, the teeth about half the transverse diameter of the corresponding teeth in *G. vistoriae*.

Entire upperparts uniform dark chestnut red, without trace of spots or bands; this color, in reduced intensity, extends over the underparts from the pectoral region to the base of the tail, lightening to dull red mesially with a slight mixture of whitish hairs along the midline of abdomen; head from muzzle posteriorly and laterally to the eyes, pale fuscous brown with a tinge of reddish, broken by a pair of elongated spots of clear white between the eyes divided by a narrow fuscous band, and a narrower, more indistinct posterior pair between the anterior base of ears; a narrow black eyering; front and sides of muzzle and sides of head below eyes whitish, intensified to a clear white spot just below the anterior two thirds of each eye; ears exteriorly blackish, which color extends mesad over the lateral third on each side of the crown; ears nearly naked internally and edged with long whitish hairs; chin and throat white, passing into brownish posteriorly with scattered whitish hairs on the foreneck; tail entirely without annulations, heavily clothed with long black hairs, 45–50 mm. in length, the heavy underfur pale brownish gray, about 25–30 mm. in length; fore and hind limbs dull slightly rufescent brown, passing into blackish brown on upper surface of feet. Rhinarium similar in contour to that of *Genetta vistoriae*, but about one half smaller. Soles and palms naked, the pads not enclosed nor separated by dense fur, as in *Genetta* and *Civettictis*, with the carpal pad greatly elongated as in *Viverricula*. Pelage long and dense, that of the tail especially so, its tail equal in size to that of the most heavy-tailed examples of *G. vistoriae*.

Represented by the adult male type (skin and complete skeleton) and an imperfect native-made skin (without skull, feet, or tail), similar to the type in coloration, length of body, and in head-markings, except that the latter are yellowish through staining instead of white. (Measurements and illustrations of the cranial and external characters and a colored plate of the animal will appear in the final report on the Congo Carnivora.)

Xenogale gen. nov.

Type, *Xenogale microdon* sp. nov.

Toes 5–5; soles and palms furred; dental formula, relative size and general structure of the teeth as in *Herpestes* (s.s.); skull relatively short and broad, postpalatal region especially so; postorbital constriction deep and close behind the postorbital processes; braincase short, proportioned about as in *Ichneumia*, very different in form from the braincase of *Herpestes*; tail short and thick, as in *Ichneumia* and *Atilax*, in contrast with the long slender tail of *Herpestes*, in which the heavily haired portion is restricted to the basal third.

Xenogale presents a singular combination of characters. Externally it strongly resembles *Atilax*, particularly in the texture and coloration of the pelage, and in the field was mistaken for an *Atilax*, but in cranial characters and in dentition the two forms present little

embryos, each about 3 mm. in length. As half-grown young were common at this time it is probable that more than one litter is produced a year. As shown by tracks in the dust the tail is sometimes held completely clear of the ground when traveling; it may touch the ground at each jump; or it may be allowed to drag constantly.

A pocket mouse which was captured alive near Prescott August 3, 1910, was kept as a captive. He was fed on unthreshed heads of wheat, which he shelled out, placing the grains in his cheek pockets. The work of filling the pockets seemed to be mainly performed by the fore feet. When both pockets were full he would dig a hole in the ground on the floor of his cage and bury the wheat. He was offered bits of apple and potato, but did not eat them. After being kept for two weeks in a dry cage and fed only on wheat he was offered water, but refused it. Another pocket mouse captured in the same locality on August 25 was placed in a jar without material for a nest. The next morning the temperature had fallen to below 40° F. and the mouse was found cold and stiff. He was handled, but gave no signs of life. At 11 a.m. the temperature had risen and the mouse resumed activity. However, when the experiment was repeated the following night the mouse did not recover.

Perognathus lordi columbianus. Columbian Pocket Mouse.—Osgood (1900, p. 40) records specimens of this pocket mouse from Touchet.

Perodipus ordii columbianus. Columbian Kangaroo Rat.—Found commonly during June, 1914, in the sagebrush east of Wallula. They seemed equally abundant on drifting sand and on packed sand areas. These animals are somewhat active throughout the daytime as was shown by fresh tracks in sand where the wind was continually covering the old marks. In traveling the tail often touches the ground at each hop, but it may be carried entirely clear, or more rarely may be allowed to drag.

Zapus princeps oregonus. Blue Mountain Jumping Mouse.—A number were trapped in early August, 1914, on top of the ridge near Twin Buttes Ranger Station. Nearly all were taken in thick brush, but one was taken in western larch forest not far from a patch of buckbrush where they were abundant.

Erethizon epixanthum epixanthum. Yellow-haired Porcupine.—A porcupine is reported to have been killed a few years ago along the Walla Walla River a short distance east of Wallula. A few have also been reported from the neighborhood of Prescott. Mr. Floyd Kendall reports that they occur in the Blue Mountains.

Marmota flaviventris avara. Pallid Yellow-bellied Marmot.—Common among the rocky cliffs on both sides of Snake River at Wawawai.

Citellus columbianus columbianus. Columbian Ground Squirrel.—Common on the prairie and in the cultivated fields at Pullman. The large ground squirrels of the Touchet Valley and the Blue Mountains are also referred to this form, although they are larger in size and have a deeper red coloration on the flanks and tail than do specimens of the typical form from Pullman, Washington, and Moscow, Idaho. These squirrels are common along the Touchet Valley as far down as Lamar. At Prescott they occur in timber but are most abundant just at the edge of timber or brush. They occur along fences and sometimes climb the fence-posts. They are found in the open parts of the valleys and sometimes occur a half-mile or more out in the bunchgrass hills. In the Blue Mountains

numbers occur in buckbrush on the ridges. At Hompeg Falls a number were found in July, 1914, in lowland fir forest, especially in openings in the forest, and on rock slides near the bottom of the canyon.

Most of these squirrels go into aestivation early in the summer, but they remain active much later than do the Townsend squirrels. At Prescott several were seen as late as July 11 in 1914. In the Blue Mountains they were seen as late as July 28.

Citellus townsendii. Townsend Ground Squirrel.—Abundant in early June, 1914, in the sagebrush east of Wallula. A number also occurred in the bunchgrass of the hills to the south. These animals were very fat in preparation for their approaching aestivation. On Eureka Flat they were numerous in bunchgrass and in sagebrush areas. Throughout northern Walla Walla County they are numerous over the bunchgrass hills. In the Touchet Valley east of Prescott a few live in gardens and in open places in the timber along the river, but in general they avoid brushy or timbered areas. A few were noted April 2, 1909, at Wawawai in the grassland at the bottom of the Snake River Canyon, on the north side of the river.

A female taken at Prescott March 28, 1913, contained a number of undeveloped embryos. Partly grown young were trapped at that place on April 17 and 19 of 1913. Half-grown young were common near Wallula during the first week of June, 1914. These squirrels come out of hibernation very early in spring and tracks may often be seen on the snow. They go into aestivation early in summer, and in 1914 none were seen at Prescott after June 25.

Eutamias amoenus amoenus. Klamath Chipmunk.—Rare in the timber along the Touchet River in the prairie area as far down as Prescott. One was taken April 20, 1913, in brush two miles east of Prescott. In the Blue Mountains they are numerous in every sort of brushy habitat, but seem to be most numerous in the brush near the tops of the ridges. At Hompeg Falls numbers were seen in lowland fir, western larch, and Douglas spruce forests at the bottom of the canyon and in yellow pine forest on the lower slopes. On Butte Creek a few occurred in the brush and deciduous timber along the stream. On the higher ridges they were abundant in alpine fir, western larch, and Douglas spruce forests.

One watched July 24, 1914, near Hompeg Falls, seated himself on a small twig in the top of a service-berry bush while he ate some of the partially dried fruit. The fore feet were used to assist in handling the food. Another watched August 2 on top of the ridge near Twin Buttes Ranger Station was feeding on grass seeds. He would cut off a grass stem as high up as he could reach and then pass the head sideways through his mouth, removing the seeds and discarding the chaff as the head of grass passed through. In this case also the fore feet were used to handle the material.

Callospermophilus chrysodeirus chrysodeirus. Golden-mantled Ground Squirrel.—A number were seen about the rocky slopes and in yellow pines on the sides of the canyon at Hompeg Falls in July and August, 1914. A few were seen in buckbrush, in open alpine fir forest, in western larch forest, and in open Douglas spruce forest on the higher ridges of the mountains. They seem to prefer partially open areas and the neighborhood of rocks.

Sciurus hudsonicus richardsonii. Richardson Squirrel.—Common during July and August, 1914, in the lowland fir forest at Hompeg Falls. A few were observed in heavy Douglas spruce forest near the tops of the mountain ridges and one was seen in young lodgepole pine forest near the top of a ridge. In the canyon of Butte Creek one was seen in the top of a high cottonwood tree. They are also reported by Allen (1898, p. 266) from Blue Creek in the Blue Mountains of Walla Walla County.

Castor canadensis canadensis. Beaver.—A few live along the Touchet River east of Prescott, where their homes are in the banks of the stream. Sometimes they cause damage by gnawing fruit trees in the orchards near the river or by cutting down small trees. However, most of their labor is spent in cutting down willows or cottonwoods of little importance to the farmer. They are even of some value to the agriculturist in helping to stop with sticks and mud the leaks in the brush dams commonly placed in the river to divert water for irrigating ditches. One group of beavers in the summer of 1913 built each night a small dam across the entrance to an irrigating ditch, but when a rope was stretched across the ditch at that point they did not cause further mischief.

In the Blue Mountains beavers are reported to be common along many of the streams. In the summer of 1914 small beaver dams were found to be numerous on Butte Creek. The dams were placed across small sloughs and across the tiny streams draining from springs. Cuttings seemed to be made on all kinds of trees. Tooth marks were noted on willows, cottonwoods, thorns, and on one small Douglas spruce.

Lepus townsendii townsendii. Western White-tailed Jack Rabbit.—Reported from Touchet by Nelson (1909, p. 82). They are also reported by farmers to occur rarely on the bunchgrass hills southeast of Wallula. Near Prescott and Lyon's Ferry a number occur in the bunchgrass hills. This species does not make definite runways such as are made by the black-tailed jack rabbits. In the region near Prescott they become paler in winter than in summer, but no white individuals have been noted.

Lepus bairdii bairdii. Rocky Mountain Snowshoe Rabbit.—A few were seen in July and August, 1914, in lowland fir forest near Hompeg Falls. One well grown young was shot in lowland fir forest along Butte Creek and signs were numerous in the brush along that stream. On top of the ridges near Twin Buttes Ranger Station signs were seen in damp Douglas spruce forest and were very numerous in patches of buckbrush.

Lepus californicus wallawalla. Washington Jack Rabbit.—Abundant during June, 1914, in the sagebrush of western Walla Walla County. A few were seen in the bunchgrass hills southeast of Wallula and they were fairly common in the bunchgrass hills north of Nine-mile. On Eureka Flat and the Lower Flat a few were seen and runways were numerous in sagebrush and in bunchgrass. They are rarely found in the bunchgrass areas near Prescott. The type locality of the subspecies is Touchet (Merriam, 1904, p. 137).

These jack rabbits make well-defined trails. Their forms are often placed under a sagebrush just on one side of the trail, or a form may be placed right in the trail. Usually these forms are only a slight depression in the ground, but sometimes under a thick sagebrush a more elaborate form requiring quite a little digging is constructed. Washington jack rabbits seem to be most active in the

morning and evening, although they are active more or less throughout the day and night. While I was camped near Wallula in June, 1914, they were in the habit of coming to an irrigating ditch to drink, and in the evening fifteen or twenty might be in sight at a time. They were especially numerous after a very hot day. During the hottest days they were not very active and seemed to dislike to leave their forms.

When the tail of the black-tailed jack rabbit is curled up, the black marking on the upper side of the tail and that on the lower part of the rump is concealed, and the animal appears entirely dull gray from the rear. When the tail hangs down the black marking is very conspicuous and might well serve as a directive mark. When the animal is moving normally the tail hangs down, and it is not curled up when the rabbit is shot at or when running away from a dog. Seemingly the marking is concealed only when the animal is at rest in its form. At other times it acts as a directive mark, and the animal is able to escape its enemies by means of its great speed.

These jack rabbits are extensively hunted near Wallula by sportsmen who come from Walla Walla and other towns, but they still maintain their abundance. Old males become very shy, but the young individuals and females are less wary. The young, many of which were nearly full grown in June, are excellent eating. The night trains on the railroads near Wallula are reported to run over and kill a great many, which, blinded by the light, refuse to leave the track.

Sylvilagus nuttallii nuttallii. Washington Cottontail.—Common in the willows along the Walla Walla River east of Wallula and numerous in the sage-brush, especially within a short distance of streams. On June 16, 1914, one was seen among rocks on a hillside southeast of Wallula, and several half-grown young were seen in the bunchgrass of the hills above. A number occur in the timber along the Touchet River near Prescott. In late June, 1914, a few were seen about the rocks and cliffs of the canyon of the Snake River at Lyon's Ferry, and they are reported to be quite common among these rocks.

Cervus canadensis canadensis. Wapiti.—Mr. Floyd Kendall reports that wapiti formerly occurred in the Blue Mountains, but that none now occur there, except a few which have been reared in captivity and liberated.

Odocoileus hemionus hemionus. Rocky Mountain Mule Deer.—There are perhaps several species of deer in the Blue Mountains of Washington, but the mule deer is the only one certainly known to be present. During the summer of 1914 a few tracks of deer were seen in lowland fir forest near the head of the North Fork of the Touchet River. A number of tracks were found and one deer was seen in Douglas spruce forest on the ridges near Twin Buttes Ranger Station. They are reported to be most abundant in the brush at the heads of coves and on the higher slopes of the mountains. Mr. Chas. Clague captured a fawn, seemingly lost, in the bunchgrass hills two miles southwest of Prescott in the spring of 1890, following a heavy snow. No deer normally occur in that region.

Alces americanus shirasi. Shiras Moose.—Mr. Floyd Kendall reports that moose formerly occurred in the Blue Mountains, but that none are now found there.

Ovis canadensis canadensis. Bighorn.—Bighorns are said by Mr. Floyd Kendall to have formerly occurred in southeastern Washington in the Blue Mountains, but to be now extinct in the region.

Oreamnos americanus missoulæ. Missoula Goat.—Goats are reported by Mr. Floyd Kendall to have occurred at one time in the Blue Mountains of Washington, but they are now absent from the region.

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EXPLANATION OF PLATES

PLATE 1

FIG. 1. COTTONWOOD-WILLOW HABITAT ALONG THE TOUCHET RIVER TWO MILES EAST OF PRESCOTT

Under the high cottonwood trees there is a very thick growth of underbrush. September 14, 1915.

FIG. 2. YELLOW PINE COVERED HILLSIDES ON THE SOUTH FORK OF THE TOUCHET RIVER ABOUT TEN MILES ABOVE DAYTON

In the valley Douglas spruces are dominant. A cultivated field is in the foreground. August 1, 1915.

PLATE 2

FIG. 1. RABBIT BRUSH HABITAT IN THE SAGEBRUSH AREA FOUR MILES EAST OF WALLULA

The plants are chiefly rabbit brush, *Chrysothamnus*. June 13, 1914.

FIG. 2. THE CANYON OF SNAKE RIVER, LOOKING WEST FROM LYON'S FERRY

Along the river are numerous high cliffs of basalt, while the hills above are covered by bunchgrass. The river is about 1000 feet below the tops of the hills. June 24, 1914.

similarity. It resembles *Ichneumia* in external form, in its long heavy overhair, and in having furred palms and soles, thus differing in this latter respect from both *Herpestes* and *Atilax*. It has the light and rather weak dentition of *Herpestes*, but the skull is relatively much shorter, broader and heavier than in the latter, with the postpalatal region correspondingly shorter and wider. The short, thick tail also contrasts strongly with the attenuate tail of *Herpestes*.

Xenogale microdon sp. nov.

Type, No. 51625, ♂ ad., Akenge, Belgian Congo, December 4, 1913; Herbert Lang and James P. Chapin, American Museum Congo Expedition. Original No. 2194.

Small-toothed, with a general external resemblance to the *Atilax* group. Upper parts of body with the overhair black broadly annulated with rufous, giving a grizzled effect of deep black and ochraceous orange; the individual hairs are light at base passing into black, the outer half black ringed and tipped with ochraceous or wholly black; underfur pale buff, darker at extreme base; tail like the back at base, becoming lighter apically without distinctive change (to black or white) at tip, the hairs individually buff at base, broadly ringed with black near the middle and subapically ringed with whitish; limbs uniform brownish black to intense black (in different individuals); head distinctly lighter than body, the hairs short and conspicuously tipped with whitish, giving a grizzled grayish effect; ventral area similar to the back but more suffused with rufous which prevails over the black; foreneck from the axillar line to lower part of the throat blackish the hairs conspicuously tipped with whitish, giving a grizzled effect; chin, sides of head and top of nose with a brownish tone, the hairs extremely short; palms and soles bare as in *Ichneumia*. (A fuller description, with detailed measurements and illustrations of cranial and external characters, will appear in the final report on the Congo Carnivora.)

THE GENERIC NAMES MUNGOS AND HERPESTES

The specific name *mungo* dates from Gmelin, 1788 (Syst. Nat., I. p. 84), *Viverra mungo* being the second species of his genus *Viverra*. His *Viverra mungo* was based primarily on the banded mongoose of Africa, although the habitat is given as India, and references to various indeterminate Asiatic species are included among his bibliographic citations under *V. mungos*.

As no diagnosis is given by which the species can be identified it must be determined by the first identifiable reference. The first reference is "Schreber, Säugethiere, III, p. 430, t.CXVIA, CXVIB." Schreber's plate CXVI is an accredited copy of Buffon's figure of "La Mangouste." Buffon and Daubenton supposed that their specimens

came from India, but no definite place of origin is mentioned for any of the several specimens mentioned by them. Hence for the next half century Buffon's "La Mangouste" was believed to be an Indian species. It was not till 1835 that Daubenton's plate and description were recognized as based on the banded mongoose of Africa, currently known in technical literature as *Crossarchus fasciatus* (Desmarest).

In 1803 E. Geoffroy, in his 'Catalogue des Mammifères du Museum nationale d'Histoire naturelle' (Paris), redescribed 'La Mangouste' of Buffon and Daubenton *from the specimen which served as the basis of the original description*, under "La Mangouste de l' Inde, *Ichneumon mungo*," giving its distinctive characters as "Pelage varié de roux et de noir, par zones transversales; queue pointue; pieds pentadactyles." Among his citations are "La Mangouste, Buff. Daubt. t. 13, pp. 150-160, pl. 19;" "*Viverra mungo*, Schreber, tabl. 116;" "*Viverra mungo*, Lin. Gmel., p. 84, pl. 7." Then follows a detailed description, its "patrie" ("Les indes orientales"), the number of the specimen in the catalogue of the Museum ("No. ccxxiv"), followed by the remark: "Individu qui a servi de sujet pour la descript. précédente, et celle de Buffon." The identity of the original La Mangouste is thus thoroughly established.

Desmarest, in his 'Mammalogie' (I, 1820, p. 211), gave essentially the same description, based doubtless on the original type-specimen, under the names "Mangouste à bandes, *Herpestes mungo*." Three years later (Dict. Sci. nat., XXIX, 1823, p. 58) he changed the technical name to *Herpestes fasciatus*, because the name *mungo* was not "classical." He repeats the geographical error: "La mangouste à bandes est particulière à l'Inde." Fischer (Syn. Mamm., 1829, p. 163), six years later, under *Mangusta mungo*, says: "Hab. in India orientali." In fact, the real habitat of La Mangouste, alias Mangouste à bandes, was first made known by Ogilby in 1835, when in an account of a collection of mammals collected in Gambia (Proc. Zool. Soc. London, 1835, 101), he says: "Mr. Rendall has brought over specimens of two *Herpestes*, one of which, the *Herpestes Mongos* of Linnæus, very well figured and described by Buffon (Hist. Nat., tom. xiii, tab. 19), deserves to be noticed, for the purpose of correcting the habitat of the species, which, upon Buffon's authority, has hitherto been given as India, but which Mr. Rendall's specimens clearly show to be the west coast of Africa. The mistake originally arose from Buffon's having identified the *Mangouste à bandes*, the species under consideration, with the *Mongos* of Kämpfer, unquestionably an Indian

species (the *Herpestes griseus* of authors), and still commonly called by that name in Upper India, where many natives and Europeans keep it in a semidomestic state, for the purpose of destroying vermin.

. . . . "

Thomas, in 1882, in his important paper 'On the African Mongooses' (Proc. Zool. Soc. London, 1882, pp. 59–93, pl. iii) said, under *Crossarchus fasciatus* (l. c., p. 91): "This species by its locality, and not *C. zebra*, no doubt represents the early-known '*Viverra mungo*' which was said to come from the 'East Indies.' No cross-striped Mongooses, however, are known from India, and the original specimens must have been obtained from the Cape. Probably, however, tame examples were sometimes brought down to Cape-town, where they would be seen by the earlier travellers." Thomas was so fully convinced that the *Viverra mungo* Gmelin is the *Crossarchus fasciatus* of later writers that he felt called upon to explain in a footnote his reason for ignoring the rule of priority in this case and accepting *fasciatus* instead of *mungo*, as follows: "This name '*mungo*' is so utterly barbarous, and that of *fasciatus* so well known, that I think we are justified in ignoring it and using Desmarest's classical and appropriate term" (l. c., footnote to p. 90).

The status of *Viverra mungo* (= La Mangouste of Buffon and Daubenton) has a vital bearing on the correct application of the generic name *Mungos*, revived in 1907 to replace *Herpestes* Illiger (1811). It also has an equally important bearing on the specific name of the 'Common Mongoose' of India.

The genus *Mungos*, like many of the early genera of post-Linnean origin, was introduced rather informally and without much detail by E. Geoffroy and G. Cuvier in their 'Memoire sur une nouvelle division des Mammifères' in the 'Magasin Encyclopédique' in 1795. This memoire is stated by the authors to be merely a sketch or outline to be amplified later, and that some of the genera are presented provisionally. The higher groups are only briefly characterized, and their content indicated by an enumeration of the genera, designated only by vernacular names, followed by technical names in parentheses, of the species respectively referred to them. The following are examples from the Plantigrades (l. c., p. 184): ". . . les ours (*ursus*, L.); les rats (*ursus lotor*, L.); les coatis (*viverrae nasua*, *narica*, *tetradactila* et *vulpecula*, L.); les blaireaux (*ursus meles*, etc); . . . les mangoustes (*viverra ichneumon* et *mungos*):"

The 10 genera referred to the Plantigrades follow in a single column, the vernacular names standing first and the technical equivalent following it in parenthesis, thus:

"Ours (<i>Ursus</i>).	Coati (<i>Nasua</i>).
Raton (<i>Lotor</i>).	Kincajou (<i>Potos</i>).
Glouton (<i>Gulo</i>).	Taupe (<i>Talpa</i>).
Blaireaux (<i>Taxus</i>).	Musaraigne (<i>Sorex</i>).
Mangouste (<i>Mungos</i>).	Herrisson (<i>Erinaceus</i>)."

Four of these genera are credited to Linne; two (*Gulo*, *Nasua*) date from Storr (1780); the other four (*Lotor*, *Taxus*, *Mungos*, *Potos*) first appear here, but two of them are antedated by names given by Storr (*Lotor* by *Procyon*, *Taxus* by *Meles*), leaving two, *Mungos* and *Potos*, both in current use. *Potos* was monotypic, with "*Viverra caudivolvula*, L." as type. *Mungos* contained two species, *Viverra ichneumon* Linné and *Viverra mungo* Gmelin. *Viverra mungo* is therefore automatically the genotype of *Mungos*. Furthermore, *Viverra mungo* is not a species of *Herpestes* Illiger (type, *Viverra ichneumon* Linné, by several "subsequent designations"), it being noncongeneric with the genotype of *Herpestes*.

As already shown 'La Mangouste' of Buffon and Daubenton is the banded mongoose of Africa, the *Crossarchus fasciatus* of current nomenclature, which should henceforth bear the name *Mungos mungo* (Gmelin). *Ariela* Gray (1864) is a synonym of *Mungos*, having been especially founded for the South African banded mongoose (*Ichneumon tænionotus* A. Smith) under a misapprehension of its real characters. *Mungos* of Gray (Proc. Zool. Soc. London, 1864, pp. 575-577), it singularly happens, is essentially the *Mungos* of Geoffroy and Cuvier, although Gray apparently knew nothing of the *Mungos* of these earlier French authors, this agreement being apparently a coincidence. Under his *Mungos fasciatus* Gray placed *Herpestes mungo* Desmarest, thus rendering this species, under modern rules, automatically the genotype of his genus *Mungos*.

The restoration of *Mungos* to its proper place in nomenclature need not in the least disturb the stability of *Crossarchus* F. Cuvier (1825), which has, by monotypy, *Crossarchus obscurus* F. Cuvier as its genotype, for which and later described allied forms it should be retained. As thus restricted *Crossarchus* forms a group very different from the banded mongooses for which *Mungos* is available and to which it should be restricted. Gray showed good judgment in separating the two

groups generically. Attention has recently been called to the generic distinctness of these groups by Pocock⁴ he adopting for the banded mongooses Gray's unavailable name *Ariela*. He also calls attention to the fact that the inclusion of the two groups under *Crossarchus* was due to erroneous information concerning the structure of the anal glands. Before meeting with Pocock's paper I had become strongly impressed with their incongruity and their evident generic distinctness.

Herpestes Illiger (1811), genotype,⁵ *Viverra ichneumon* Linné, after almost universal employ for three fourths of a century, was hastily and, as it now appears, needlessly displaced in 1907⁶ by *Mungos* Geoffroy and Cuvier and immediately the latter became current for the greater part of the mongooses of both Africa and Asia. It should now be returned to its time-honored place in nomenclature, through the allocation of *Mungos* to its proper station.

As already shown, not only is *Mungos* untenable as a genus name for any Indian mongoose, but also the species name *mungo* is equally a misnomer when applied in the same connection, it belonging unquestionably to the banded mongoose group of Africa.

A NEW SUBSPECIES OF BEAVER FROM NORTH DAKOTA

By VERNON BAILEY

In attempting to identify the beavers of North Dakota, for inclusion in my report on the mammals of the State, I find it necessary to apply a new subspecific name to those occupying the Missouri River drainage. Strange to say the specimens show closer affinity with those of the Rio Grande drainage, than with those in the same State in the streams flowing into Hudson Bay. Under permit from the State Game Commission, I was allowed to collect two specimens in Apple Creek, about 7 miles east of Bismarck, and there are a number of additional skulls from along the Missouri and Little Missouri Rivers. While it is very desirable to obtain more material, and especially skins taken at

⁴ On the severance of *Ariela* Gray (= *Mungos* s.s.) from *Crossarchus* see Pocock, Proc. Zool. Soc. London, 1916, p. 350 and text figures on pp. 353, 356, 360, 369.

⁵ By subsequent designation, Anderson, Yunnan Exped., 1878, p. 171; Thomas. Proc. Zool. Soc., 1882, p. 63.

⁶ Cf. Thomas, Ann. Mag. Nat. Hist. (7), XX, p. 119, footnote.

different seasons of the year, the specimens available at present are sufficient to show reliable characters. A much more extended study will be necessary to determine the limits of range of this form and whether it conforms strictly to the drainage system of the Missouri River or only a part of it. The form may be known by the following description:

Castor canadensis missouriensis subsp. nov.

Type from Apple Creek, 7 miles east of Bismarck, North Dakota. Male, immature, No. 205763, U. S. National Museum, Biological Survey Collection. Collected September 1, 1914, by Vernon Bailey. Original No. 9,703.

General characters:—Slightly smaller than *canadensis* and much paler and duller brown. Skull more triangular in outline, not so massive and heavy; much like that of *mexicanus*, shorter and heavier than that of *frondator*. From *mexicanus* the colors differ in being noticeably duller and darker; from *frondator*, duller, and not so rusty.

Color of type specimen in fresh short September fur, back from nose to tail, rich hazel brown; duller on sides, and more yellowish on sides of face and neck; lowerparts smoky grayish brown, with a touch of light chestnut at base of tail and over tops of feet. Young of year almost exactly the same in coloration. Specimens from the Yellowstone Park (Yanceys), in long winter fur, are slightly brighter hazel over the back, but very similar otherwise.

Skull of type specimen not sufficiently developed for fair comparison with old individuals, but agreeing in general characters with adults from the same region. A fully adult skull in the National Museum Collection, No. 2377, labeled "Upper Missouri, Lieutenant Warren," and another good skull from old Fort Stevenson (McLean County), also show the triangular shape, light structure, and narrow interorbital region of this form.

Measurements of type in the flesh (probably 18 months old and not fully grown)—Total length, 900; tail, 270; hind foot, 170; naked part of tail, length, 230, width, 130 mm. Skull, basal length, 110; nasals, 41 (22.4 wide); zygomatic width, 87; mastoid width, 60; interorbital width, 21; postorbital width of brain case, 45; alveolar length of upper molar series, 27.5 mm. Measurements of skull No. 2377, U. S. National Museum Collection, from Upper Missouri, basal length, 130; nasals, 49; zygomatic width, 102; mastoid width, 67; interorbital width, 25; postorbital width of brain case, 48 alveolar length of upper molar series, 32 mm. Weight of type specimen estimated at 35 or 40 pounds.

NAMES OF SOME SOUTH AMERICAN MAMMALS

BY WILFRED H. OSGOOD

Among required nomenclatural changes revealed in the preparation of a list of the technical names of South American mammals are the following to which it seems desirable that attention be called as early as possible.

***Euphractus sexcinctus flavimanus* Desmarest**

Tatou poyou ou Tatou a main jaune AZARA, Quad. Paraguay, II, p. 142, 1801.
Loricatus flavimanus DESMAREST, Nouv. Dict. d'Hist. Nat., xxi, p. 433, 1803
 (common name); ibid, xxiv, Tab. Meth. Mamm., p. 28, 1804.

Dasyurus flavipes FISCHER, Zoognosia, III, pp. 122–124, 1814.

Dasyurus gilvipes ILLIGER, Abhandl. K. Akad. Wiss., Berlin (1811), p. 108,
 1815-nomen nudum; LICHTENSTEIN, Abhandl. K. Akad. Wiss., Berlin (1814–
 15), p. 215, 1818.

Dasyurus sexcinctus gilvipes THOMAS, Ann. & Mag. Nat. Hist., (7), xx, p. 165,
 1907.

Euphractus sexcinctus gilvipes ALLEN, Bull. Am. Mus. Nat. Hist., xxxv, p.
 564, August 9, 1916.

The name *gilvipes*, now in use for the Paraguayan form of the six-banded armadillo, is antedated by two others, *flavipes* Fischer, 1814, and *flavimanus* Desmarest, 1804. The proper name for this form, therefore, is *Euphractus sexcinctus flavimanus* Desmarest.

***Tolypeutes matacus* Desmarest**

Tatou huitième, ou Tatou mataco AZARA, Quad. Paraguay, II, p. 197, 1801.
Loricatus matacus DESMAREST, Nouv. Dict. d'Hist. Nat., xxiv, Tab. Meth.
 Mamm., p. 28, 1804.

Tolypeutes conurus GEOFFROY, Rev. Zool., Paris, p. 137, April 1847; Comptes
 Rendus, xxiv, p. 575, January–June, 1847.

If the mataco of Azara is distinct from the Linnaean species (*tricinctus*), the name *conurus* should be replaced by *matacus* of Desmarest which has many years priority.

***Zaëdyus pichiy* Desmarest**

Tatou septième, ou Tatou pichiy AZARA, Quad. Paraguay, II, p. 192, 1801.
Loricatus pichiy DESMAREST, Nouv. Dict. d'Hist. Nat., xxiv, Tab. Meth.
 Mamm., p. 28, 1804.

Dasypus ciliatus FISCHER, Zoognosia, III, p. 127, 1814.

Dasypus patagonicus DESMAREST, Nouv. Dict. d'Hist. Nat., xxxii, pp. 491-492, 1819.

Dasypus minutus DESMAREST, Mamm., II, p. 371, 1822.

Euphractus marginatus WAGLER, Natürl. Syst. d. Amphibien, p. 36, 1830.

Of the three names given by Desmarest to the pichiy armadillo, the latest, *minutus*, is found most frequently in literature while the earliest, *pichiy*, seems to have been entirely overlooked. The name *minutus* has of late been replaced by *ciliatus* of Fischer, but this should give way to *pichiy*. A further synonym, rarely cited, is *Euphractus marginatus* Wagler, also based on Azara.

Cavia tschudii arequipæ nom. nov.

Cavia tschudii pallidior THOMAS, Ann. & Mag. Nat. Hist., (8), xix, p. 158, January, 1917—not *Kerodon niata pallidior* Thomas 1902 [= *Cavia (Monticavia) niata pallidior*].

If *Monticavia* be regarded as no more than a subgenus of *Cavia*, then *C. t. pallidior*, 1917, is preoccupied by *K. n. pallidior*, 1902, and requires a new name. Mr. Thomas, who proposed both names, treats *Monticavia* as a full genus and therefore would make no change, but for those who wish to be consistent in opposing the recognition of slightly characterized groups as full genera, action as above is demanded

Canis australis Kerr

Antarctic Fox PENNANT, Hist. Quad., I, p. 240, 1781.

Canis vulpes australis KERR, Anim. Kingd., p. 144, No. 259, 1792.

Canis antarcticus BECHSTEIN, Uebers. Vierf. Thiere Pennant, I., p. 271, footnote, 1799; SHAW, Gen. Zool., I, p. 331, 1800.

Canis (Pseudalopex) australis ALLEN, Bull. Am. Mus. Nat. Hist., VII, p. 188, June 20, 1895.

Canis antarcticus ALLEN, Mamm. Patagonia, p. 153, Apr. 28, 1905.

Dusicyon antarcticus THOMAS, Ann. & Mag. Nat. Hist., (8), XIII, pp. 353-354, March, 1914.

Although Allen in 1895 (l. c.) called attention to the priority of Kerr's name *australis* for the Falkland Island dog, the name has not been brought into use. Even Allen himself in 1905 (l. c.) fails to mention it and uses *antarcticus* of Shaw in discussing the subgeneric position of the species. Since its basis is identical with that of *antarcticus*,

it must be adopted and the type locality may be regarded as West Falkland Island to agree with the selection made by Thomas for *antarcticus* in 1914 (l. c.).

Chrysocyon brachyurus Illiger

Agouara-gouazou AZARA, Quad. Paraguay, I, p. 307, 1801.

Canis brachyurus ILLIGER, Abhandl. K. Akad. Wiss., Berlin, (1811), pp. 109, 121, 1815.

Vulpes cancrosa OKEN, Lehrb. d. Naturgesch., III, Zool., pp. 1036–1037, 1816.

Canis jubatus DESMAREST, Mamm., I, pp. 198–199, suppl. pl. 6, fig. 1, 1820.

Canis campestris WIED, Beitr. Naturg. Bras., II, pp. 334–338, 1826.

Canis isodactylus AMEGHINO, Anales Mus. Nac. Buenos Aires, (3), VI, pp. 9–14, 1906.

As indicated above, the red wolf or maned wolf of southern Brazil, Paraguay, and northern Argentina should be called *Chrysocyon brachyurus*. The current name *jubatus* is antedated not only by *brachyurus* of Illiger but also by *cancrosa* of Oken and since all three are based on Azara, there can be no question as to the necessity of adopting the earliest.

C. campestris Wied was practically a substitute for *jubatus* on grounds of greater appropriateness. *C. isodactylus* Ameghino, as noted by Winge and Ihering (Rev. Mus. Paulista, viii, pp. 205–206, 1911), also appears to be a synonym.

Tayra barbara sinuensis Humboldt

Mustela sinuensis HUMBOLDT, Rec. d'Obs. Zool. Anat. Comp., I, pp. 347–348, 1812 (not later than August 7).

This name, based on specimens from the mouth of the Rio Sinu, Bolivar, Colombia, appears to have been overlooked. Whether it should displace a name already in use is uncertain, without specimens from the type locality. This locality lies almost equidistant from the Veragua District of Panama from which *T. b. biologiae* Thomas, 1900, was described and the Santa Marta District of Colombia from which comes *T. b. irara* Allen, 1904.

Cebus xanthosternos Wied

Simia variegata HUMBOLDT, Rec. d'Obs. Zool. Anat. Comp., I, pp. 356, 362, 1812 (not later than August 7)—not *Simia (Sapajus) variegatus* Kerr, Anim. Kingd., Mamm., p. 79, No. 77, 1792 [= *Saimiri* sp.?].

Cebus variegatus GEOFFROY, Ann. Mus. d'Hist. Nat. Paris, xix, p. 111, October, 1812.

Cebus xanthosternos WIED, Reise nach Brasilien, I, p. 371, footnote, 1820; KUHL, Beitr. Zool. vergl. Anat., p. 35, 1820; WIED, Beitr. Naturg. Bras., II, pp. 90-97, 1826—Boca d'Obu, near Belmonte, Bahia, Brazil.

Simia variegata Humboldt, as shown by Sherborn and Thomas (see Ann. & Mag. Nat. Hist., (8), xii, p. 567, footnote, 1913), antedates *Cebus variegatus* Geoffroy. It is preoccupied by *Simia (Sapajus) variegatus* Kerr which refers to an unidentifiable squirrel monkey received from Antigua. The next available name seems to be *Cebus xanthosternos* Wied, 1820.

NOTES ON THE FOX SQUIRRELS OF SOUTHEASTERN
UNITED STATES, WITH DESCRIPTION OF A
NEW FORM FROM FLORIDA

BY ARTHUR H. HOWELL

The fox squirrels, throughout the greater part of their range in southeastern United States, dwell almost exclusively in open pine forests. In the mountainous regions of northern Alabama they are found to some extent in mixed timber (oaks, hickories, pines, etc.), and in central and southern Florida they inhabit also cypress swamps. On the southwest coast of Florida a well marked form has developed in the damp, dark forests of black- and red-mangrove which extend practically without a break from Marco Pass to Cape Sable and around the southern end of the peninsula to the shores of Biscayne Bay on the east coast.

In this region the animal is known as the 'black mangrove squirrel' and is said to be not uncommon. Several days spent in hunting through these mosquito-infested forests resulted, however, in seeing only one of the squirrels, which escaped before I could get a shot at it. The type was secured for me by an Indian boy, who knew where its home tree was located. Another specimen, examined while at Everglade, agreed closely with the type.

The National Museum collection (including that of the Biological Survey) contains a large series of fox squirrels from various parts of Florida and a few from southern South Carolina—the type region of *Sciurus niger*. Through the courtesy of the authorities of the Museum

of Comparative Zoology, I have been enabled to examine, also, a fine series of 12 specimens from the coast region of Georgia (Barrington and Hursman's Lake).

Typical *Sciurus niger* is subject to great variation in color and exhibits three well-marked color phases. These may be called the gray phase, the buff phase, and the black or melanistic phase. The gray phase, in its extreme form (specimen from Georgetown, S. C., in Biological Survey Collection) is pale smoke gray above, including the tail, and white beneath. The crown is black or blackish and the nose, ears, and feet white. Some specimens in this phase have the feet and under side of tail buff, thus approaching the next darker phase. In the buff phase, the general tone of the upperparts is pinkish buff, the underparts, feet, and underside of tail rich cinnamon-buff or clay color. Numerous intermediate specimens connect this phase with the gray phase. The black or melanistic phase—well-known as occurring frequently in many species of squirrels—is wholly or partly black or dark brown, except the nose and ears, which are white. The large series from northern and middle Florida agrees quite closely with the series from South Carolina and Georgia except that the gray individuals are darker above and tinged with buff below. Both the gray and the buff phases are represented, the latter, however, more numerously.

The new race is much deeper colored than any of the series of *niger*; it is apparently restricted in its typical form to the mangrove swamps, for numerous specimens examined from the pine and cypress forests of Lee and Dade counties, Florida, are variously intermediate between *niger* and *avicennia*, many of them indistinguishable in color from *niger*, although always smaller.

*Sciurus niger avicennia*¹ subsp. nov.

MANGROVE FOX SQUIRREL

Type, No. 231498, U. S. Natl. Mus., Biological Survey Collection; ♂ adult, skin and skull, from Everglade, Lee County, Florida; collected March 14, 1919, by A. H. Howell; original number 2325.

Characters.—Similar to *Sciurus niger niger* but decidedly smaller; coloration much darker (more tawny) both above and below; feet clearer white (less tinged with buff).

¹ In allusion to its favorite haunts in forests of black mangrove (*Avicennia nitida*).¹

Description of type.—Nose, lips, and front of face white; ears white, with a patch of cinnamon-buff at base; head and fore back black, sprinkled with cinnamon; hinder back cinnamon, shading on sides to orange-cinnamon; front legs blackish, washed with orange-cinnamon, the feet and toes white, faintly shaded with buff; hind legs orange-cinnamon shaded with black; hind feet blackish, mixed with grayish white and broadly edged with whitish; toes white; thighs with a long black patch on outer side; tail above, orange-cinnamon, mixed with black (the bases of the hairs black) shading on sides to hazel; under surface of tail rich tawny, the hairs with a subterminal band of black; terminal central portion of tail white for about 3 inches; underparts dull orange-cinnamon, washed on throat and breast with black and white.

Measurements.—Type (adult ♂): Total length, 535; tail vertebrae, 260; hind foot, 75. *Skull.*—Occipito-nasal length, 65.5; zygomatic breadth, 37.4; mastoid breadth, 25.4; interorbital breadth, 20.6; least postorbital breadth, 19.5; length of nasals, 25.2; maxillary tooth row, 13.

GENERAL NOTES

THE GEORGIAN BAT, *PIPISTRELLUS SUBFLAVUS*, IN WISCONSIN

Under the name *Scotophilus georgianus*, *Pipistrellus subflavus* (F. Cuvier) was recorded from Wisconsin by Strong who merely listed it without exact locality or date of capture (Geol. Wisconsin, Survey of 1873-1879, vol. 1, p. 438, 1883). In view of the fact that Strong apparently treated in a like manner all the bats known from eastern and northern states without having local records, Hollister rightly considered this one not to be entitled to a place in the Wisconsin list (Bull. Wisconsin Nat. Hist. Soc., vol. 8, p. 31, 1910). It is of more than local interest to place on record a skin and skull (No. 229219, U. S. National Museum, Biological Survey collection) of an adult male of this species collected by the writer, August 29, 1918, at Devil's Lake, in the Baraboo Range, Sauk County, Wisconsin. It was shot in the dusk of late evening as it was flying over a narrow road through heavy deciduous woods at the base of rugged and rocky hills.

—Hartley H. T. Jackson.

IS THE JAGUAR ENTITLED TO A PLACE IN THE CALIFORNIA FAUNA?

Several of the early voyagers who touched in California enumerate the jaguar (*Felis onca*) among the native mammals. Thus, in the early part of the last century Langsdorff mentions it as among the species occurring in the Monterey region (*Voyage and Travels*, II, 213, 1814). And Beechey, in describing the region between San Francisco and Monterey, under date of December, 1826, says: "The lion (*felis concolor* ?) and the tiger (*felis onca* ?) are natives of these woods, but we never saw them; the inhabitants say they are small, and that the lion is less than the tiger, but more powerful." (*Beechey's Narrative*, Vol. 2,

p. 79, 1831). In this connection it should be observed that to this day the Spanish Californians and Indians invariably apply the term 'lion' to the mountain lion or cougar. A little later Saint-Amant, in a work published in Paris in 1854, recorded the jaguar as a California mammal. (*Voyages en Californie et dans l'Oregon*, p. 537, 1854).

It has been customary to look askance at these early records, but the detailed account of a family of jaguars seen repeatedly in the Tehachapi Mountains by James Capen Adams, as recorded by the late Judge Theodore Hittell, is so circumstantial as to admit of no question as to the identity of the animal. Adams either saw a pair of jaguars and their young, or he lied out of whole cloth. While neither the date nor the exact locality are stated, we are told that Adams, after leaving the Tejon and traveling over a rough mountainous country, camped at a spring in a gorge facing the Great Basin. The rough mountainous country traversed was of course the Tehachapi Mountains, and the part of the Great Basin looked out upon must have been the western part of the Mohave Desert.

The first night of his stay at the spring he was awakened by a fearful snuffing and snorting among his animals and saw in the darkness two spots like balls of fire, which he recognized as the eyes of the beast that had frightened his horses. The next day, taking his hunting companions—a tame grizzly named 'Ben' and his dog 'Rambler'—he followed the trail of the animal for four or five miles to another gorge, where he finally located the den in a cave on the side of a cliff in an exceedingly rough and inaccessible place. "In its mouth, and scattered below it, were multitudes of bones and skeletons of various kinds of animals, and among others, of Mountain Sheep, making the place look like the yard of a slaughter-house."

A few nights later he was wakened by a roar, and in the feeble light of a new moon saw "a spotted animal, resembling a tiger in size and form, with two young ones." Another night, soon after dark, the male appeared at the mouth of the den, "looked around, and sniffed the air, and then leaped down, and going a few yards placed his paws upon a rock, and stretched himself, yawning at the same time as if he were waking up out of a sleep. A few minutes afterwards the female appeared, and approaching, lapped his brawny neck." The male, as nearly as could be seen, "was twice as large as the ordinary cougar, and appeared to be covered with dark round spots of great richness and beauty."

For several weeks Adams continued his fruitless attempts to trap or kill the animals, obtaining from time to time passing glimpses of them, until finally he unexpectedly came across the mother and cubs in a gorge far away from the den. He fired at her, whereupon his grizzly 'Ben' and dog 'Rambler' bounded forward and "engaged with her in a terrific combat, but she tore them dreadfully and managed to escape." (*Adventures of James Capen Adams, Mountaineer & Grizzly Bear Hunter of California*, by Theodore H. Hittell, San Francisco, 359–369, 1860).

Since writing the above, Vernon Bailey has called my attention to an old record by Pattie, which I read many years ago but had forgotten. Pattie states that when on islands in the delta of Colorado River, they killed an animal like an African leopard which came into their camp, and was the first of its kind they had ever seen (James O. Pattie, Personal Narrative, Cincinnati, 1833).

Still another bit of evidence comes from the Indian tribes of Southern California. An old chief of the Kammei tribe (called by the Spanish 'Diegenos') told me that in the Cuyamaca Mountain region in San Diego County, the 'Tiger,' while rare, was well known to the old Indians, who call it the 'Big-spotted Lion,' *Hut'-tē-kul'ch*.

—C. Hart Merriam.

AN EASY METHOD OF CLEANING SKULLS

One of the chief factors which deter ornithologists from taking up mammalogy is the lack of a standard method by which skulls may be cleaned quickly and in a satisfactory manner. All of the old published information in regard to maceration and boiling is of a very hazy character, and there are few of us who have not ruined valuable material while trying these methods.

The writer has been especially interested in the preparation of skulls and skeletons, and has not only tried every method of which he could learn, but has experimented and tested many modes of procedure which held even slight prospect of success. My experience has made me very skeptical of employing chemicals, for one cannot be sure of their future effects on skulls. Although some of them apparently are satisfactory for the present, we have no means of being sure that they will not have destroyed the skulls within twenty or thirty years, and it would be nothing short of a calamity if the types of today are not preserved for far longer than that. Usually the skull is of more importance than the skin, and much care should be employed in its preparation.

The cleaning of a skull really begins when the animal is skinned. As soon as the skin is turned right side out, the skull should be detached from the body, the tongue and flesh between the lower jaw and the muscles below the zygomata carefully cut away, a durable tag with waterproof ink attached, the brains removed with a syringe, and the skull dropped into a jar of denatured alcohol. The latter will replace the water in the skull and "dry" it at once, and the skulls can be removed in a couple of days, or left indefinitely. It is of the greatest importance to dry all skulls quickly (but not by artificial heat), for if decomposition once starts, the sutures are loosened, and this can never be remedied in the future. If one has no alcohol at hand, drop the skulls into a can of water for a couple of days, after which dry them as soon as possible. The water will soak out most of the blood, and the finished specimen will be much whiter. Needless to say, the alcohol does this also. If the skulls become infested with maggots, pour a little gasoline or alcohol over them, or soak for an hour in water, but *never* pour boiling water over them, for the sudden change in temperature will crack the canines of the carnivores, and render the molars of some rodents so brittle that they continually break off.

At home I keep a large jar of naphtha into which I place all skulls which are dry. I am not sure that this is necessary after the alcohol bath, but it finishes the process of degreasing, and greaseless skulls will turn out several hundred per cent whiter than those which have not been so treated. I take them out of the naphtha several days before I intend finishing them, or long enough ahead for the liquid thoroughly to evaporate.

Take a batch of skulls of the same size and place them in soft water—use distilled water if that from the tap is hard. Soak an hour for shrews and the smallest bats, six hours for mice, twelve for rats, and twenty-four for larger forms. They should be soaked slightly longer during cold weather than in summer, or in a warm room. Next prepare a one per cent solution of hydrogen peroxide—two parts of water and one of the commercial product,—put the skulls into a small covered pan and pour on just enough of the liquid to float them. Place on a stove and time from when the boiling point is reached—three minutes for shrews and small bats, eight or ten minutes for mice, fifteen for rats, and longer in proportion for larger species. One must not fail to cook skulls of juveniles for a shorter time than those of adults. At the expiration of the cooking period, place the pan under a trickle of cold water until fully cooled. Remember never to douse cold skulls in hot water nor hot skulls in cold. The skulls, especially the larger ones, may be left for twenty-four hours as they now are, but I always like to begin work on them at once. The instruments which I have found to be of most help in the actual cleaning are two knife blades, one of them the smallest which can be procured, and the other a trifle larger fine tweezers, fine scissors, and an embryo hook or bent pin for removing bits of brain. The rest is patience, perseverance and great care.

By this method I can clean a dozen or more small skulls an hour, and so perfectly that not one zygomatic arch in a hundred will be broken, nor a lower jaw disarticulated. If I cooked them longer, I could do much faster work, but the sutures would be loosened, and I would not have any skulls of mine cooked to the point where twenty-five or thirty could be cleaned in an hour.

If these instructions are followed, the skulls will dry out as white as one could wish, the smaller ones especially, absolutely free from blood stains, all sutures firm and in such condition that they should last indefinitely. Also, there is no chemical present to work possible harm, for the peroxide is more of a mechanical mixture than a chemical one. In the case of skulls of coyote and larger, it is probably advisable to soak in melted paraffine and dry in a moderate heat. This closes the pores and prevents the teeth from splitting, but it will detract somewhat from their appearance. Skulls may be bleached snow white, but in a large working collection, this is hardly advisable, for the sutures are then almost invisible, and comparative work is done with considerable difficulty.

—A. Brazier Howell.

WHY SHOULD EVERY SPECIMEN BE NAMED?

The desire on the part of museum curators and others to identify and label the specimens that come into their possession is natural and commendable, but like many other good things may be carried too far.

In the course of my personal experience—and doubtless the same is true of others—I have been urged by professional naturalists to name specimens which to my mind were unidentifiable. A name was demanded to put on the label, and the mere fact that the specimen could not be satisfactorily identified was set aside as of minor consequence. The cry was, "What are you going to call it? Give it a name. What name shall we write on the label?" And I have known naturalists of reputation, in revising groups, to write names on the labels

of many specimens that could not be referred with certainty to any species. To my mind this is bad science, bad example, and bad morals.

Specimens of mammals and birds are subject to several conditions and vicissitudes, any one of which may render identification doubtful if not positively erroneous. Among these may be mentioned immaturity, poor or imperfect condition, worn pelage or plumage, intermediate position between two or more described forms, or—most distressing of all—peculiarities exhibited by the single specimen from a remote locality—a specimen which, until others are received, cannot be satisfactorily disposed of, either by referring it to an unknown geographic race (subspecies) or by regarding it as a case of individual or fortuitous variation, thus leaving the author's best judgment enshrouded in doubt.

The pernicious practice—one might say mania—of naming every specimen is a stumbling block in the progress of science and is particularly unfortunate when done by the revisor of a group, whose authority is accepted by students. For students naturally adopt as final the determinations they find in the handwriting of the expert, regarding specimens so labeled as typical of the species or subspecies whose names they bear. But as a matter of fact many of the specimens so labeled are not only not typical, but are either unidentifiable, or so exactly intermediate between the species in question and some other, that the name of the other would be equally applicable.

In this connection, a recent protest by P. A. Taverner of the Geological Survey of Canada is worth repeating. He says: "The truth is, we cannot with absolute certainty identify every specimen we study. Why then deceive ourselves and mislead others by making a bluff at doing the impossible? Why not own up honestly and admit that we cannot name such material? We may state that we think it is so and so and where necessary give reasons for the conclusion, but to pass as fact what is only opinion is not the spirit of modern science." (*The Auk*, Vol. 36, No. 2, p. 317, April, 1919.)

—C. Hart Merriam.

RECENT LITERATURE

(Received since April 1, 1919)

Hollister, N. EAST AFRICAN MAMMALS IN THE UNITED STATES NATIONAL MUSEUM. Bulletin 99, U. S. Nat. Mus. PART I. INSECTIVORA, CHIROPтерA, AND CARNIVORA. Pp. 1-194, text fig. 1-3, pls. 1-55, August 16, 1918. PART II. RODENTIA, LAGOMORPHA, AND TUBULIDENTATA. Pp. i-x, 1-184, text fig. 1, pls. 1-44, May 16, 1919.

This work, as represented by the two parts that have appeared, is a critical list of 349 species and subspecies of East African mammals contained in the United States National Museum and comprising the majority of those known. The third part, as yet unpublished, will include the primates and ungulates, and the whole will thus form the nearest approach to a technical compendium of the mammals of this part of the world that can reasonably be hoped for at this time. The area covered by the list is an arbitrary one including the political divisions of Sudan, Somali, Abyssinia, Uganda, British East Africa, and German East Africa. The treatment is largely critical and technical, serving to coordinate a great part of the scattered work that has been done in recent years. Besides lists of localities for each species, there is much miscellaneous biological data mainly from the field notes of the collectors, and with each group of species there is an extensive table of measurements of individual specimens, including a large number of types. The extent and value of these tables may be indicated by noting that for two subspecies of lions cranial and dental measurements are given for no less than forty-six specimens. Another feature of great usefulness is found in the half-tone plates of the skulls of type-specimens including all those possessed by the Museum, sixty-three in Part I and seventy-five in Part II. Most of these are shown in natural size and in two, or frequently three, aspects. Those of Part I are uniformly of very high quality and, taken in connection with the measurements, furnish a basis for comparison closely approximating that of the specimens themselves. Those of Part II are in a number of cases not so well executed as those of Part I.

The labor connected with such a list as this is prodigious and, as the author states, it involves "what amounts to monographic work in each group and careful identification of every specimen." That it has been exceedingly well done is very evident to anyone having even a slight acquaintance with the field it covers. The specimens upon which the list is based were mostly obtained in recent years principally by two expeditions, the Smithsonian African Expedition led by Colonel Roosevelt and the Paul J. Rainey Expedition, both of which were accompanied by that experienced and successful collector, Edmund Heller. They illustrate in a most convincing way the value of modern methods, of trained workers, and of concentrated attack on a particular field. Of the 349 forms listed, 223, or 63 per cent, have been discovered and described in the last ten years. Only 81, or 20 per cent, were known prior to the year 1900. The total number of specimens examined was 6696. It is evident, therefore, that hopes may not be wholly vain for a knowledge of the mammals of other continents coordinate with that we now have for North America.

—W. H. Osgood.

Hall, Maurice C. THE ADULT TAENIOID CESTODES OF DOGS AND CATS, AND RELATED CARNIVORES IN NORTH AMERICA. Proc. U. S. National Mus., vol. 55, pp. 1-94, April 11, 1919.

This paper includes descriptions of all the adult tapeworms of the superfamily Taenioidea known to occur in dogs, cats, and related carnivores in North America, together with species of the same superfamily not yet recorded as present in North America, but found in other parts of the world, and liable to occur in carnivores in this country. Secondary, as well as primary, hosts are given. Since carnivores seldom prey upon carnivores, but may frequently prey upon other mammals, and since the secondary host must be eaten by the primary host, it follows that most of the secondary hosts belong to other orders of mammals, more particularly to rodents, lagomorphs and ungulates. Of especial interest to mammalogists is the list of both primary and secondary hosts (pp. 79-84) in which are listed species of mammals belonging to twenty-one families, only four of which are carnivores.

—Hartley H. T. Jackson.

Davis, John J. CONTRIBUTIONS TO A KNOWLEDGE OF THE NATURAL ENEMIES OF PHYLOPHAGA. Bull. Illinois State Nat. Hist. Surv., vol. 13, pp. 53-138, pl. 3-15, February, 1919.

The mammalian enemies of the common white grub are discussed on pp. 127-132. The common skunk (*Mephitis*) is considered the most important of these, while the common mole (*Scalopus aquaticus*) is rated second. Among other mammals known to feed on the white grub are the raccoon, coyote, fox, opossum, striped and Franklin's ground squirrels (*Citellus tridecemlineatus* and *C. franklini*), short-tailed shrew (*Blarina brevicauda*), badger and the domestic pig.

—Hartley H. T. Jackson.

ALLEN, GLOVER M. The American collared lemmings (*Dicrostonyx*). Bull. Mus. Comp. Zool., vol. 62, no. 13, pp. 509-540; text fig. 1; pl. 1. February, 1919. (Complete revision; one new species, *D. exsul*, from St. Lawrence Island.)

ALLEN, JOEL ASAPH. Nelson's "Wild Animals of North America:" a review. Nat. Hist., vol. 19, no. 3, pp. 330-333. March, 1919.

BAYLIS, H. A. A remarkable *Cysticercus* from a rare dolphin (*Cysticercus tenuis grimaldii*, Moniez, 1889). Ann. and Mag. Nat. Hist., ser. 9, vol. 3, pp. 417-424. April, 1919. (Record of *Lagenorhynchus acutus* on the Lincolnshire coast.)

CABRERA ANGEL. Dos nuevos antílopes de la subfamilia *Tragelaphinæ*. Bol. Real Soc. española Hist. nat., vol. 18, pp. 274-277. May, 1918. (*Tragelaphus scriptus heterochrous* from west slope of Mt. Elgon; *Limnotragus spekei inornatus* from Northeastern Rhodesia.)

CABRERA ANGEL. Sobre los *Odocoileus* de Colombia. Bol. Real Soc. española Hist. nat. vol. 18, pp. 300-307, pl. 8. June, 1918. (Key to the subspecies of *O. gymnotis*.)

CASTLE, W. E. Siamese, an albinistic color variation in cats. Amer. Nat., vol. 53, p. 265-268. May-June, 1919.

- EARNSHAW, FRANK L. See Lawyer and Earnshaw.
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EDITORIAL COMMENT

The American Society of Mammalogists was founded at Washington, D. C., April 3, 1919. After much preliminary work, the committee appointed to consider plans for the organization of such a society issued a call for a meeting on April 3 and 4, 1919, at the National Museum. Over 250 favorable responses were received before April 3, and sixty persons from many parts of the United States and Canada were present for the opening meeting on that day. Plans for the Society were perfected, officers elected, committees formed, and by-laws and rules were adopted. The objects of the Society were declared to be "the promotion of the interests of mammalogy by holding meetings, issuing a serial or other publications, aiding research, and engaging in such other activities as may be deemed expedient." Systematic work, life history and habits of mammals, evolution; palæontology, anatomy, and every phase of technical and popular mammalogy are to come within the scope of the society and its publications. New members and advance subscriptions for the Journal have been steadily received since the organization meeting and the permanent success of the Society and its publications seems assured.

One of the principal objects of the Society is the publication of the *Journal of Mammalogy*. It is aimed to make this journal indispensable to all workers in every branch of mammalogy and of value to every person interested in mammals, be he systematist, palæontologist, anatomist, museum or zoological

garden man, sportsman, big game hunter, or just plain naturalist. Toward this end the help of each member and friend of the society is urged. General articles on mammals, recent and fossil, are solicited for publication, and authoritative papers on all branches of the study can be used. Papers of general interest on life-histories, distribution, and habits are particularly needed, in order that the Journal may not be overbalanced with purely technical matter. It is comparatively easy to get manuscripts of systematic papers, but those members of the Society who are active in other branches of the study must help if the Journal is to be of interest to all. The departments reserved for General Notes and Correspondence can be made especially interesting. There are hundreds of good "general notes" of value if members will take the time to write them up for publication. The Committee on Publications will gladly receive any suggestions for the improvement of the Journal.

Each member is requested to endeavor to obtain new members for the Society and subscriptions from institutions and libraries where full sets will eventually be needed. Obviously there can be no "free list" for such a publication until it is well on its feet, and the early numbers of biological publications have a way of becoming in a short time excessively rare and difficult to obtain. Take your copy to the authorities in charge of libraries and institutions and urge their subscriptions, to begin with the first number. The fee for Life Membership is seventy-five dollars, and several have been elected to this class.

Members of the Society are indebted to Mr. Ernest Thompson Seton for the drawing of the prong-horn antelope for the front cover decoration. Mr. Seton is an enthusiastic supporter of the new Society, has qualified for Life Membership, and promises some illustrated articles for future numbers of the Journal. He has recently been honored by La Société nationale d'Acclimatation de France for his successful researches in the breeding of fur-bearing animals and has received the Silver Medal. The award was decided upon in 1914, but on account of the war the presentation was postponed. The medal bears the date of 1918, and is the first official French Peace Decoration received by an American since the signing of the armistice. The French authorities see in fur farming an opportunity for crippled soldiers. Mr. Seton's experiments during the past ten years or more have been chiefly with minks, martens, foxes, and skunks.

One of the first acts of the Society after organization, was to elect as an Honorary Member Dr. J. A. Allen, of the American Museum of Natural History, New York. Doctor Allen was the only person elected to this class.

The Annual Meeting of the American Society of Mammalogists for 1920 will be held in New York City at a date to be determined later by the Council.

So many systematic mammalogists believe in the "test of intergradation" as the only criterion for the recognition of subspecies, that some interesting correspondence in the Journal should result from Doctor Merriam's paper in this issue. The opinion in this matter is pretty deeply grounded in the minds of the majority of American workers and is no doubt in a great measure due to the definite stand taken by the committee which framed the original A. O. U. Code of Nomenclature. The remarks of this committee under Canon XI were to the effect that "the kind or quality, not the degree or quantity, of difference of one

organism from another determines its fitness to be named trinomially rather than binomially. . . . In a word, *intergradation* is the touchstone of trinomialism." The later A. O. U. committee, which prepared the Revised Edition of the Code, accepted these remarks without change, but added that "two kinds of intergradation, however, may be recognized; (1) ordinary or geographic intergradation, and (2) intergradation due to individual variation in forms inhabiting isolated areas." Doctor Merriam is of course right in his statement that intergradation is often assumed rather than proved. But at any rate the author of a revision, by the use of the trinomial, can show that he believes that intergradation does take place as indicated; and as he has given the group close study and not infrequently has examined a very large amount of material, his opinion on the matter would seem to have a certain definite value to others.

—N. H.

AMERICAN SOCIETY OF MAMMALOGISTS

BY-LAWS AND RULES ADOPTED APRIL 3, 1919

BY-LAWS

Article I. Name and Objects

Sec. 1. This society shall be known as the American Society of Mammalogists.
Sec. 2. The object of the Society shall be the promotion of the interests of mammalogy by holding meetings, issuing a serial or other publications, aiding research, and engaging in such other activities as may be deemed expedient.

Article II. Membership

Sec. 1. The Society shall consist of members, honorary members, and patrons.
Sec. 2. Any person may become a member of the Society upon recommendation of two members and election at the next annual stated meeting, or by special election at other times by a two-thirds vote of the Council, each Councilor having been given thirty days notice. A member is entitled to vote for all officers and to receive the serial publication of the Society.

Sec. 3. Honorary members shall be elected by a majority vote of the Society upon unanimous recommendation of the Council in recognition of distinguished services to mammalogy. They shall be exempt from all dues and shall be entitled to all privileges of members except that they shall not be eligible to office or to membership on the Council.

Sec. 4. Any person upon payment of one thousand dollars to the Society may, upon recommendation of the Council, be elected a patron and shall be entitled to all the privileges of a member, shall receive all publications of the Society, and shall be exempt from membership fees.

Article III. Officers

Sec. 1. The officers of the Society shall be a President, two Vice-Presidents, a Recording Secretary, a Corresponding Secretary, and a Treasurer. These, together with the Editor and ten persons elected from the Society at large, shall constitute the Council or Board of Managers of the Society.

Sec. 2. The officers of the Society shall be elected annually and shall be eligible for reelection; and such officers shall perform their duties until their successors shall qualify. The Editor shall be appointed by the Council. Five members of the Council shall be elected annually from the Society at large and shall serve for two years. Officers shall be elected by a majority vote at the annual meeting, and their official term shall commence at the close of the meeting at which they are elected.

Sec. 3. Vacancies among the officers or in the Council may be filled temporarily by appointment by the Council; but persons so appointed shall hold office only until the next meeting of the Society.

Article IV. Meetings

Sec. 1. An annual stated meeting shall be held in accordance with the action of the Society at the preceding annual meeting. The Corresponding Secretary shall give due notice of such meetings.

Sec. 2. A special meeting of the Society may be called at any time by order of the Council, provided that notice of the purpose of the meeting has been given at least thirty days in advance.

Sec. 3. Sections of the Society may be organized by five or more members in any locality, with the approval of the Council of the Society in each case, for the purpose of holding meetings for the presentation of papers or discussion. Sections may have their own officers and rules, but such rules shall not conflict with the By-laws or Rules of the Society. Each section shall present to the Society an annual report of its activities.

Article V. Quorum

Twenty-five shall constitute a quorum of the Society and five a quorum of the Council.

Article VI. Amendments

Amendments to these By-laws, recommended by the Council, may be adopted at any annual stated meeting by a two-thirds vote of the members present, provided that notice of each proposed amendment has been sent to each member two months before the meeting.

Article VII. Rules

Upon recommendation of the Council, Rules may be adopted, amended, or repealed at any annual stated meeting by a majority vote.

Article VIII. Fees and Accounts

Sec. 1. Annual dues for members shall be three dollars payable in advance.

Sec. 2. Any member upon payment of seventy-five dollars to the Society at any one time shall be entitled to life membership, and shall be exempt from membership dues.

Sec. 3. All moneys received from life members and patrons in consideration of their election as such, and all gifts for undesignated purposes, shall be invested as a permanent fund, the income of which may be used for special purposes as directed by a three-fourths vote of the Council.

Sec. 4. The accounts of the Treasurer shall be audited as directed by the Council at the close of each year before presentation at the annual stated meeting of the Society.

RULES

Rule I. Election of Officers

The election of officers shall be conducted as follows:

Nominations shall be made in each case by an informal ballot, and the result announced by the Secretary, after which the first formal ballot shall be taken.

In balloting for Vice-Presidents and the five additional members of the Council, each member shall write on one ballot as many names as there are officers to elect, namely, two on the first ballot for Vice-Presidents and five on the first ballot for members of the Council; and on each subsequent ballot as many names as there are officers still to be elected. Those persons who receive a majority of the votes cast shall be declared elected, providing that the number of persons receiving a majority does not exceed the number of persons to be elected, in which case the vacancies shall be filled by the candidates receiving the highest majorities.

If in any case the informal ballot result in giving a majority for one or more of the persons balloted for, it may be declared formal by a majority vote.

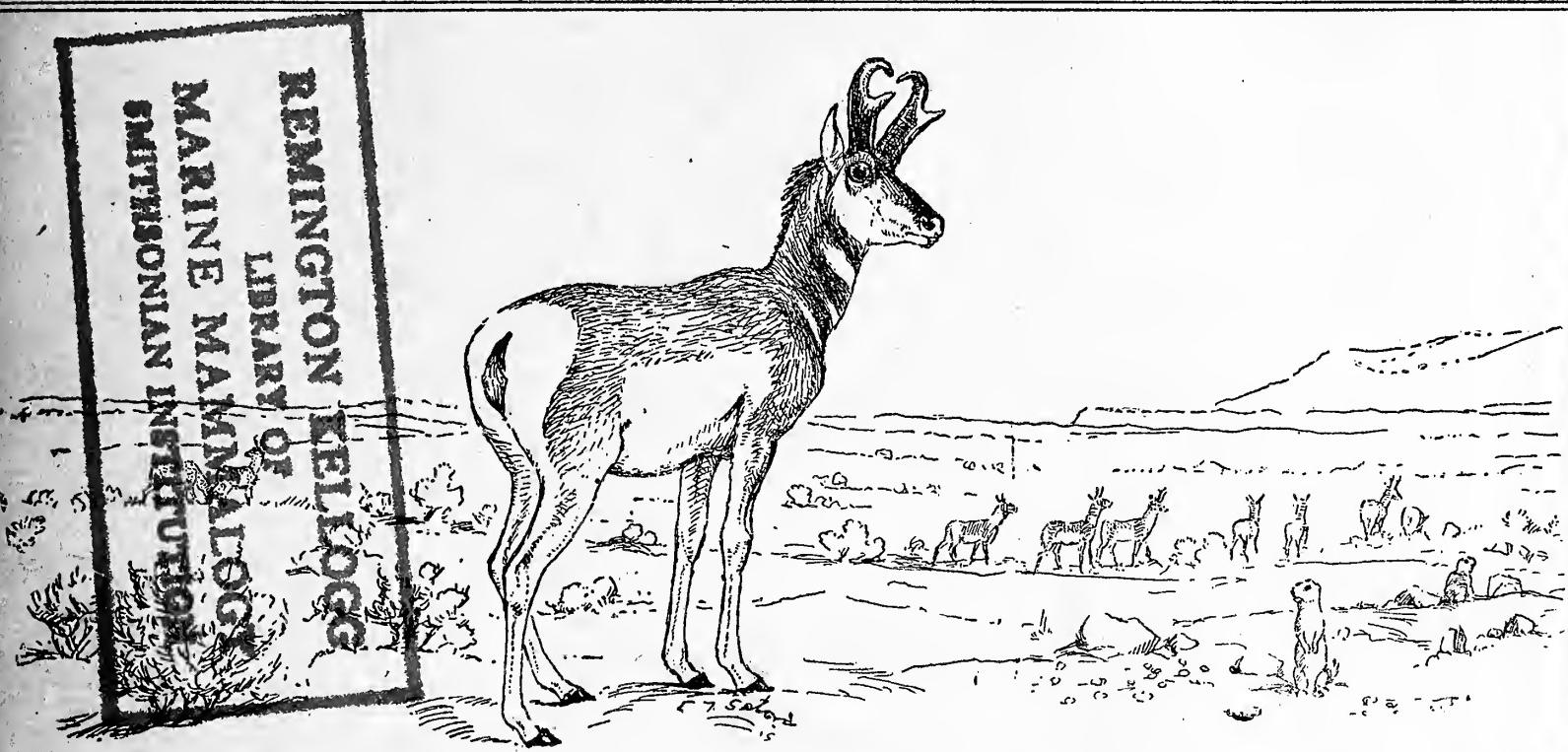
Rule II. Order of Business

The order of business at the annual stated meeting unless changed by a two-thirds vote of members present shall be as follows:

1. Reading and approval of the minutes of the previous meeting.
2. Report of the Recording Secretary.
3. Report of the Corresponding Secretary.
4. Report of the Treasurer.
5. Election of members.
6. Election of officers and members of the Council.
7. Appointment of committees.
8. Report and recommendations of the Council.
9. Action on business reported from the Council.
10. Consideration of amendments to By-laws and Rules.
11. Reports of committees.
12. New and unfinished business.
13. Reading of minutes of the meeting.

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The American Society of Mammalogists

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No. 2

MIGRATIONS OF THE GRAYSQUIRREL (*SCIURUS CAROLINENSIS*)

By ERNEST THOMPSON SETON

One of the most interesting animal phenomena recorded by the early naturalists was the migration, or rather the emigration, of the gray-squirrel.

A true migratory animal is one that makes a periodic change of range, which has a definite going, and a definite return. Thus the migration of birds, bats, and caribou are definite seasonal changes followed always by a return movement, but the migration of the gray-squirrel will I think be found in a different class.

In all the early natural histories this squirrel is called "migratory," and amazing accounts are given of its armies appearing to devastate the farms of whole regions. I have found no living man recently, who has seen one of these and can describe it, so must rest content with a compilation from two rambling accounts by the naturalists Kennicott, U. S. Pat. Off. Rept. for 1856 (1857) and Bachman (Quad. N. Amer., 1846). The paragraphs from each are followed by the initials "K." or "B."

The most interesting feature in the habits of this animal is the remarkable migration performed at times by large bodies of them. . . . Immense numbers congregate in autumn, and move off together, continuing their progress in the same general direction, whatever it may be [nearly all recorded moved easterly, one only south, and one north], not even turning aside for large streams. . . . They moved along rather leisurely, stopping to feed in the fields, and upon the abundant nuts and acorns of the forests. So far had they departed from their accustomed habits that they were seen on the prairie, four or five miles from any timber; but even there, as usual, they disliked to travel on the ground, and ran along the fences wherever it was possible. (K.)

The farmers in the Western wilds regard them with sensations which may be compared to the anxious apprehensions of the Eastern nations at the flight of the devouring locust. At such periods, which usually occur in autumn, the squirrels congregate in different districts of the far Northwest; and in irregular troops bend their way instinctively in an eastern direction. Mountains, cleared fields, the narrow bays of our lakes, or our broad rivers, present no unconquerable impediments. Onward they come, devouring on their way everything that is suited to their taste, laying waste the corn and wheat-fields of the farmer; and as their numbers are thinned by the gun, the dog, and the club, others fall in and fill up the ranks, till they occasion infinite mischief, and call forth more than empty threats of vengeance. (B.)

Ordinarily averse to entering the water, they now take to it boldly, and though swimming with difficulty, manage to cross broad rivers, like the Niagara and the Ohio, though many are drowned in the attempt. . . .

Sometimes, when on these migrations, especially after crossing rivers, the squirrels become so fatigued as to be easily captured, and thousands are then killed by boys armed merely with sticks and stones. I learn from Dr. John A. Kennicott that, during one of these migrations, innumerable squirrels swam across the river Niagara, and landed near Buffalo, New York, in such a state of exhaustion that the boys caught them in their hands, or knocked them from the fences and bushes with poles. (K.)

They swam the Hudson in various places between Waterford and Saratoga; those which we observed crossing the river were swimming deep and awkwardly, their bodies and tails wholly submerged; several that had been drowned were carried downwards by the stream, and those which were so fortunate as to reach the opposite bank were so wet and fatigued, that the boys stationed there with clubs found no difficulty in securing them alive or in killing them. Their migrations on that occasion did not, as far as we could learn, extend farther eastward than the mountains of Vermont; many remained in the county of Rensselaer, and it was remarked that for several years afterwards squirrels were far more numerous there than before. It is doubtful whether any ever return to the west, as, finding forests and food suited to their taste and habits, they take up their permanent residence in their newly explored country, where they remain and propagate their species, until they are gradually thinned off by the increase of inhabitants, new clearings, and the dexterity of the sportsmen around them. (B.)

AFTER THE TREK

After one of these grand migrations, very few of the species are found in the localities from which they have moved, and these, as if alarmed at the unusual solitude, are silent and shy. They rapidly increase in numbers, however, and, in a few years, are as abundant as before. I am not aware that they ever migrate except when exceedingly abundant. Of these immense hordes, but few probably survive. No sudden increase in their numbers was heard of in Southern Wisconsin after the several migrations from Northern Illinois. Many are drowned in attempting to cross streams as has been stated; not a few are destroyed by man; some die from utter exhaustion; and, when thus forced to travel, in an unnatural manner, upon the ground, they fall an easy prey to rapacious birds and mammals, all of which feast when the squirrels migrate. (K.)

These migrations are now a thing of the past, so that we can but piece together the accounts of the earlier naturalists, in seeking to explain such movements of the squirrel population. There are not many of these records, and those that exist are commonly deficient in not stating the direction or extent of the migration. The earliest I find is in Kalm's "Travels," p. 316. He speaks of a squirrel migration from the mountains to the lowlands of eastern Pennsylvania in 1747.

The best observations are by Dr. P. R. Hoy of Racine, Wisconsin. He witnessed a great migration of squirrels from Wisconsin, southwest, for four weeks in the early autumn of 1842, and again in 1847, 1852, and 1857.

Dr. S. P. Hildreth (*Pioneer History of the Ohio Valley*), 1848, quotes from the manuscript of Col. James Baker, of the graysquirrel "coming in millions from the north to the south, destroying whole fields of corn in a few days." (*Mam. Ohio*, H. W. Brayton, 1882.)

Doctor Bachman states that in the autumn of 1808 or 1809 great hordes came from the west into northern New York and Vermont; and of yet another migration in 1819 on the Ohio, 100 miles below Cincinnati, when for about 130 miles he saw "large numbers of Squirrels swimming across the river" "strewed as it were on the surface of the water." This is the only available note that indicates the width of the migrating army.

Robert Kennicott records a migration from Canada across the Niagara River into western New York. According to the Bay City Tribune (Michigan) February 17, 1907, there was a great squirrel migration there in 1866.

A careful review of the evidence makes it very clear that these movements of the squirrels were not in any true sense migrations. That is, they were not seasonal or annual or periodic or balanced by a return movement of any kind. They were simply wholesale movements of a huge population from one region to another. Judging from numerous parallel cases, such a movement could arise only from one of five causes: Flood, fire, famine, pests or over-population. There is no evidence for the first or second; as to famine, Kennicott, who has the most complete and detailed observations of all, makes a point of it that they are not driven forth by want of food, for the animals are fat at the time and the regions they leave still abound with food. Furthermore, the season when they go forth is early autumn, the time of the greatest food abundance. The migration that Merriam reports in the Adirondacks and that Jackson describes in Wisconsin are very small affairs and in all respects of a different class.

It is possible that the vast multiplication of nesting places may have resulted in an insupportable increase of parasites in the shelters so that the nests had become untenable. But of this there are only two shreds of evidence at hand. One, the known fact, that overcrowded squirrel nests breed abundant parasites; second the squirrels are comparatively scarce after the army has gone. Thus the evidence is far from conclusive.

We have, then, the last cause to consider—over-population. The army has always come from a land of plenty—a place of ideal squirrel conditions—at a time when they seemed at their best, and further, the time of migration is always just as the broods of the year are full grown. No one has ever recorded a squirrel migrating from a land when they were few or moderate in numbers, always from a place where they over-abounded. No one has witnessed one of these treks since the squirrels became comparatively scarce.

This explanation is paralleled by the known causes that send the Scandinavian lemming and the African springbok millions, out of their country and on, till they meet their end; and last, probably most exactly, *by the swarming of bees*; the sallying forth of the new brood to seek a new home, for there is not room in their birthplace. In a word then, the graysquirrel swarms as the bees swarm; this explains their marching armies. But the dwindling of their numbers has put an end to their emigrations. I have not yet heard of one since 1866.

NUMBERS

How are we to form any idea of their numbers in primitive times when the whole land was one big harvest field of nuts for their chief benefit?

The early naturalists seemed satisfied to describe the squirrel hordes as "astounding," "immense," "myriads," "incredible," or "unbelievable," and we rejoice that Kennicott and others of more exact mind were born in time to make a more satisfactory record. Kalm relates (*Travels*, p. 320) that in the year 1747 the State of Pennsylvania paid bounties for the killing of 640,000 squirrels. In "*The Hunter's Feast*," published about 1840 (p. 163) is an account of an all-week Kentucky squirrel hunt in which the sides with 6 guns on each, killed respectively 5000 and 4780 squirrels.

Robert Monro writes in 1804 of squirrel hunts in western New York in which upwards of 2000 squirrels have sometimes been killed in one day. (Merriam, *Mam. Adirondacks*, p. 229.)

Dr. P. R. Hoy knew of "an Ohio hunter that killed 160 in one day in an 'off season.' In parts of Michigan, Illinois, Southern Wisconsin and Indiana, they are no less numerous." (Quad. Ill., 1857, p. 63.) Doctor Bachman saw 130 miles of the Ohio "strewed" with them in 1819; an old settler of Bay City, Michigan, records (Bay City Tribune, 17 Feb., 1907) that in the migration of 1866, one of the last, he counted 1400 squirrels while driving 2 miles.

Finally if we recall, as the third dimension, that Doctor Hoy found it took a month for the army to pass, we have some basis for calculation. Allowing that the squirrels travelled 5 miles a day, we have an army, 130 miles wide, 150 miles long, in which as many as 1400 might be seen by the road within 2 miles. That road must have been through the woods, therefore 20 yards on each side would be the limit of view. This would mean 30,000 to the square mile, or 450,000,000 squirrels in the dimensions recorded. Such numbers seem incredible, and yet that is what the old naturalists said they were, *unbelievable, incredible, etc.*

Even if we largely discount these figures, we must remember that there are many such armies and that only a small section of the range was represented; not more than one-fortieth of it.

A corroboration of these high rates is found in a recent occurrence. The graysquirrels in Central Park, New York, became over-many. It was decided to thin them out; 300 were shot in one week without making much perceptible difference. There were at least twice as many left in the woods which cover nearly half of this 800-acre park. That is, there were over 1000 to the 300 acres of timber.

In my recollection of a squirrel woods in Ontario, 1887, the numbers in Central Park are not to be compared to those in the northern woods. They were at least three times as numerous in the latter and yet we knew that there were about 3 to the acre in the park.

In western Texas there is, according to the Biological Survey, a prairiedog town of 25,000 square miles, with an estimated population of 400,000,000 or 25 to the acre. This is probably a higher rate than the graysquirrel ever attained to, but it shows the possibilities even with an animal of more than double the size.

The range of the graysquirrel is about 1,000,000 square miles; allowing, that in half of this, they were scarce, and that in the teeming parts they were no more numerous than in Central Park, we have an estimate of 1,000,000,000 as the lowest guess at the primitive number that one can arrive at. But we have noted above one of several armies that totalled nearly half a billion. Who then can doubt, in view of this,

that the graysquirrel population in the palmy days of 1800 may easily have numbered several billions.

These great movements have never been clearly observed. The only way at present possible to fill the gap is by collecting the testimony of eyewitnesses—the old-timers who are passing away—for I have little faith in any great emigration since 1870. That was about the latest date at which primitive conditions continued anywhere in the northern Mississippi Valley.

Will not our young naturalists render service now by interviewing all available old-timers—the men who joined in the squirrel hunts of the '60's—and make as full a record as possible of the time, place, extent, direction, etc., of every emigration that can be traced, together with facts that bear upon its cause and results or that in any way offer interesting light?

AN APPARENT EFFECT OF WINTER INACTIVITY UPON DISTRIBUTION OF MAMMALS

BY HARTLEY H. T. JACKSON

INTRODUCTION

It was the writer's pleasure during the past summer (1919) to spend a few weeks investigating the terrestrial vertebrate fauna of the Apostle Islands, Wisconsin, as a part of the general study of the land vertebrates of the state now being undertaken by the United States Biological Survey, the Wisconsin Geological and Natural History Survey coöperating. My first visit to the islands was from June 22 to 26, when all the time was spent on Madeline Island. I again visited the islands July 3 to 24, accompanied by Mr. Harry H. Sheldon and Mr. Arthur J. Poole who assisted in the work. On this second visit careful investigations were made on Madeline Island, July 3 and 4, 12 to 15, 20 and 21; Outer Island, July 5 to 11; Presque Isle or Stockton Island, July 15 and 16; Gull Island, July 18; Little Manitou Island or Gull Rock, July 18; Michigan Island, July 18; and Sand Island, July 23. Observations of a more or less superficial nature were also made on other islands, but physiographical conditions were such that the more intensive work on the islands selected undoubtedly gave us a fairly accurate idea of the mammalian fauna of the islands as a whole. Mr. Sheldon and Mr. Poole returned to the islands September 4 and remained until

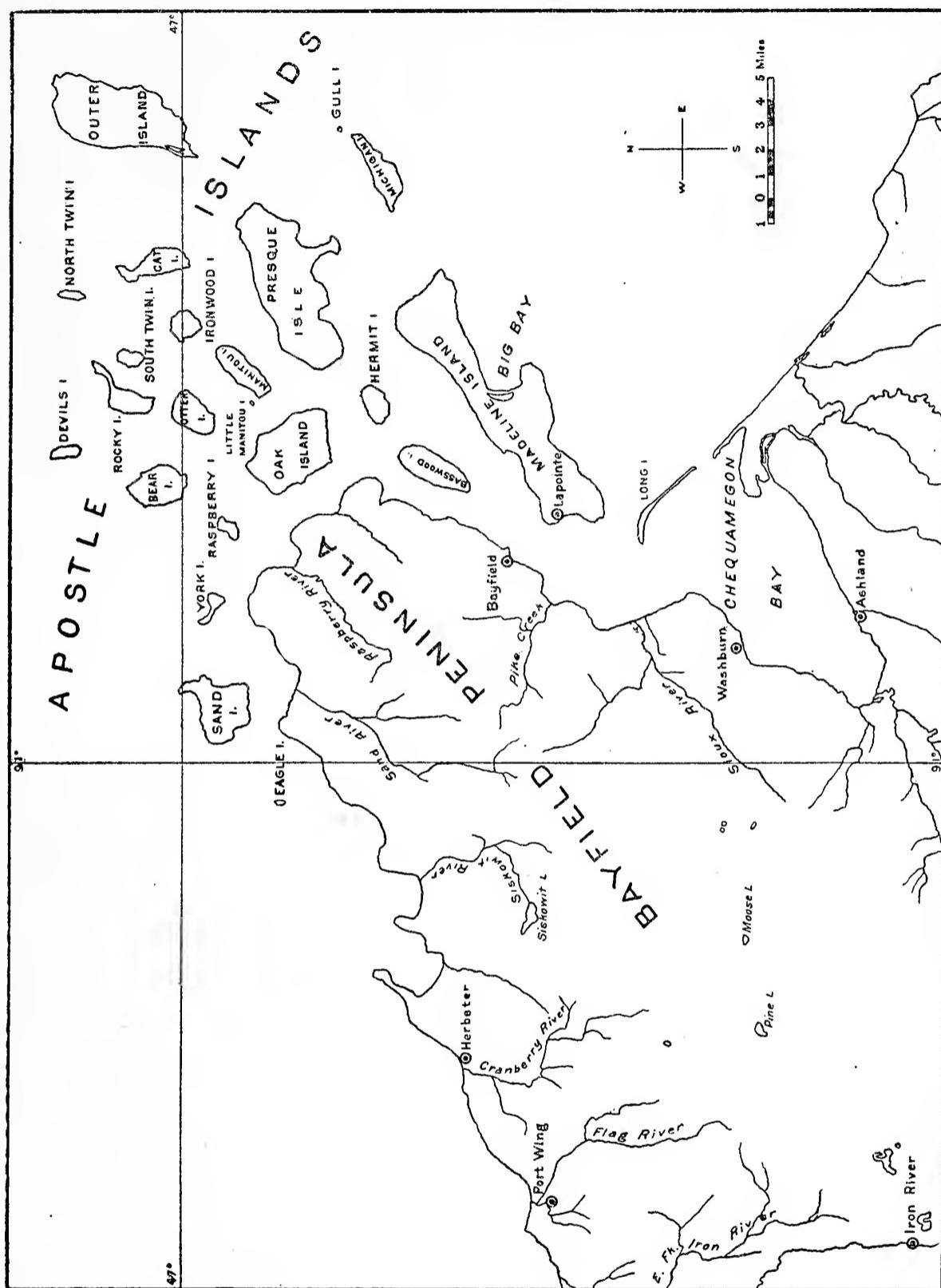


FIG. 1. MAP OF APOSTLE ISLANDS AND ADJACENT MAINLAND

September 19, spending the greater part of their time on Outer and Madeline Islands. On this last visit, however, little attention was devoted to mammals.

HISTORICAL SKETCH OF THE GEOLOGY OF THE APOSTLE ISLANDS

If one should look at a detailed map of the western end of Lake Superior there will be seen extending northeasterly from the Wisconsin shore a prominent peninsula, the terminal portion of which appears to have been submerged and separated into a number of islands. This is exactly what has taken place. In earlier geological times these islands were connected en masse with the mainland. During the Glacial Period a tilting began which has even increased since then and is probably still in progress (Martin, Wisconsin Geol. and Nat. Hist. Surv., Bull. 36, p. 424, May, 1916). The separation of the Apostle Islands from the mainland is due largely to submergence of old stream valleys during this tilting. The exact time of permanent separation is believed by some to have occurred since the last glaciation of the region, but the fact that the greatest amount of tilt in evidence since the Nipissing Stage of Lake Superior (which was late in the Glacial Period) is considerably less than one-half the depth of the water in the channel between the mainland and Oak, Basswood, and Madeline Islands, would tend to throw some doubt on such a theory. Be that as it may, during the Glacial Period the terrestrial fauna of the islands was completely destroyed by submergence of the islands in Glacial Lake Duluth which maintained a level about 500 feet above that of Lake Superior today. Lake Duluth slowly changed to the Lake Algonquin stage which stood some 350 feet above the present lake and was of sufficient depth to submerge all of the islands except Oak Island (altitude 480 feet above Lake Superior). So complete was this glacial destruction of the topography of the islands that there is no trace whatever of an old drainage system on any of them. It would seem therefore that the terrestrial fauna must be of comparatively recent ingressions.

PHYSIOGRAPHICAL FEATURES OF THE APOSTLE ISLANDS

Turning now to the present, we find the islands 23 in number and varying in size from Madeline Island which is over 12 miles long and nearly 3 wide, to Little Manitou Island (or Gull Rock) which is only 300 feet long and 30 feet broad basally, narrowing to about 5 feet in

width at the summit. Little Manitou Island will soon meet the fate of Steamboat Island which has entirely disappeared by action of wind and waves within the memory of man.

There is for the most part a general similarity in the topography of the islands. The east and northeast sides generally rise from the water's edge in precipitous red sandstone cliffs varying from 10 to 80 feet high, usually 10 to 30 feet. Sandy beaches are most likely to be on the southwestern shores. Northern, western, and southern slopes are frequently steep clay-banks. A few more or less intermittent small creeks offer some surface drainage, but most of the precipitation washes directly down the banks into the lake. There are a few sloughs surrounded by marshes and bogs on some of the islands, the largest being near Big Bay on the southeastern side of Madeline Island midway its length. Other sloughs of considerable size are near the southwestern corner of Outer Island, and near the base of Presque Isle Point towards the eastern end of Presque Isle. Each of these sloughs has been formed by a separation of a body of the lake by sand beaches. The inland sides of the sloughs tend to be more boggy than the outer sides. These bogs contain a vegetation typical of sphagnum-cassandra bogs, the tamarack and spruce growth being limited. They differ in no essential features from the same type of bog on the mainland.

The islands are covered with a Canadian Zone vegetation which on Outer, Michigan, Cat, and a few other islands has been undisturbed by civilization but on others has been more or less destroyed by lumbermen. Spruces (*Picea canadensis* and *mariana*), balsam fir (*Abies balsamea*), pines (*Pinus strobus*, *resinosa* and *divaricata*), arbor vitæ (*Thuja occidentalis*), hemlock (*Tsuga canadensis*), ground hemlock (*Taxus minor*), mountain maple (*Acer spicatum*), mountain ash (*Sorbus americana*), birches (*Betula papyrifera*, *lenta* and *lutea*), and aspens (*Populus tremuloides*) constitute a greater portion of the vegetation, while around the bogs and sloughs is found a growth of alders and willows. In all ecological features the islands offer an environment for mammals similar to that of the mainland and on casual observation one would think conditions ideal for an abundance of mammalian life. As a matter of fact mammals are poorly represented in number of individuals and, even more so, in number of species.

MAMMALIAN FAUNA OF THE APOSTLE ISLANDS COMPARED WITH THAT
OF THE MAINLAND

A comparison of the mammalian fauna of the Apostle Islands with that of the Wisconsin shore of Lake Superior reveals some interesting factors in distribution. A careful study of the mammals of the islands with intensive collecting for the smaller ones resulted in our obtaining records of only 18 species. Specimens were secured of the red squirrel (*Sciurus hudsonicus*), Canadian white-footed mouse (*Peromyscus maniculatus gracilis*), red-backed mouse (*Eotomys gapperi gapperi*), meadow mouse (*Microtus pennsylvanicus pennsylvanicus*), coyote (*Canis latrans latrans*), masked shrew (*Sorex personatus personatus*), and short-tailed shrew (*Blarina brevicauda*). Three others, Minnesota varying hare (*Lepus americanus phæonotus*), hoary bat (*Nycterus cinereus*), and a small bat (*Myotis* sp.) were seen by members of our party, the hare several times. Tracks were seen of the muskrat (*Fiber zibethicus zibethicus*) and the red fox (*Vulpes fulvus fulvus*). Reliable reports from residents of the islands show the presence of northern white-tailed deer (*Odocoileus virginianus borealis*), wharf rat (*Rattus norvegicus*), house mouse (*Mus musculus musculus*), otter (*Lutra canadensis*), a weasel (from descriptions probably *Mustela cicognanii*), and the Minnesota mink (*Mustela vison letifera*).

One who is familiar with the habits of mammals will notice that with the exception of the bats these are all mammals that are more or less active in winter. Bats probably ingressed the islands by flight in the summer season. The wharf rat and the house mouse were probably introduced in freight shipments. Others, such as the red squirrel, muskrat, otter, mink, and possibly the deer, may at times have swum from the mainland to the islands. However, except the aquatic mammals, the bats, the wharf rat and house mouse, the mammals known to inhabit the islands resolve themselves into two categories: namely, (A) those that are active in winter and wander considerable distances at such times, and (B) those that are more or less active in winter and are frequently found among driftwood and logs near the beach.

The mammals that travel considerable distances during the winter include the deer, red squirrel, varying hare, red fox, coyote, and weasel. Inquiry of residents of the islands and Bayfield disclosed the fact that each of these animals has at times been seen on the ice. Definite statements of deer, varying hares, a red fox (silver phase), and coyotes

having been shot on the ice were given. The minimum distance between the mainland and the nearer islands is approximately $1\frac{1}{2}$ miles, which would by no means be excessive even for some of the smaller mammals.

Into the second category (B), those mammals which are active in winter and frequently found among logs and driftwood near the beach, fall the Canadian white-footed mouse, red-backed mouse, meadow mouse, masked shrew, and short-tailed shrew. These mammals were probably carried to the islands on driftwood, particularly with the ice floes and jams in the spring. The power of these floes to carry debris and vegetation can be appreciated only by one who has seen the results of the impacts of this ice along the shores of the islands.

Turning now to the mammals of the mainland as represented by observations made at Bayfield, and collections and observations made at Herbster and Orienta, Wisconsin, we find present all of the species of mammals found on the islands and in addition the following relatively common: gray chipmunk (*Tamias striatus griseus*), little striped chipmunk (*Eutamias borealis neglectus*), striped ground-squirrel (*Citellus tridecemlineatus tridecemlineatus*), Canada woodchuck (*Marmota monax canadensis*), jumping mouse (*Zapus hudsonius hudsonius*), porcupine (*Erethizon dorsatum*), Mearns cottontail rabbit (*Sylvilagus floridanus mearnsi*), Minnesota skunk (*Mephitis mephitis minnesotæ*), and the black bear (*Ursus americanus americanus*). A glance at this list and we note that with the exception of the cottontail all of these mammals are inactive in winter. The cottontail has only recently ingressed the region, having made its first appearance near Bayfield within the last ten years. The same applies to the striped ground-squirrel. Of the other mammals not found on the islands the gray chipmunk, little striped chipmunk, Canada woodchuck, jumping mouse, and black bear are known to hibernate; the skunk, while not in a true state of hibernation, remains in a state of lethargy during the winter in a den in the ground; and the porcupine at this season is inactive, spending weeks at a time in the top of a single tree or in a hollow log in the forest. The hibernating mammals spend their dormant periods in nests in the ground and are well protected from the effects of ice erosion which takes place in the early spring. The point of course can be raised that only negative evidence is supplied as proof of the absence of these mammals on the islands. But this negative evidence is so strong that it is fairly conclusive. Special effort with approved means of collecting was made to obtain each of these species on the islands. Methods of calling chipmunks, ground squirrels, and woodchucks which never

failed on the mainland were futile here. Moreover old-time residents of the islands, men who were familiar with outdoor life, repeatedly told me that chipmunks, "gophers" (ground squirrels), woodchucks, porcupines, skunks, and bears were not found on the islands. One of the islands is called "Bear Island" but I could find no evidence that a bear had ever been seen on that or any other island of the group. It is said that a few cottontail rabbits have been seen at Lapointe, but I was unable to secure verification of their presence there. In view of the habits of this mammal its occurrence on the islands may be expected.

CONCLUSION

It can be seen from these remarks that the mammals known to inhabit the Apostle Islands are all more or less active during the winter, while those inhabiting the adjacent mainland and not known from the islands tend to be inactive in winter. Bearing in mind that the terrestrial biota of these islands is, geologically speaking, very recent and has been derived from the mainland, it is strongly suggested that this winter inactivity has had an influence on the distribution of certain mammals by tending to prevent them from crossing on the ice and keeping them out of the debris carried from the beaches by the ice floes. While present evidence indicates complete isolation of mammals inactive in winter from the islands, it would seem that this restriction would retard ingressions of these mammals onto the islands rather than completely inhibit it.

THE FLORIDA WATER-RAT (NEOFIBER ALLENI) IN OKEFINOKEE SWAMP, GEORGIA

By FRANCIS HARPER

[Plate 3]

At the present time, while energetic efforts are being made by the Okefenokee Society to save this paradise of woods and waters from complete destruction by lumbering and other commercial operations, it seems worth while to call attention to one of its most recently discovered features of zoological interest.

In 1912, during the course of reconnaissance work by Dr. A. H. Wright and others of the Cornell expedition,¹ as well as by the writer, some curious grass nests, of mammalian manufacture, were noticed on Floyd's Island Prairie. Nothing more than conjectures could be made at that time regarding the identity of the nest-makers, since no specimens were obtained, and since there were no published records of *Neofiber* from farther north than Gainesville, Florida. The mystery was solved in early January, 1917, when, with the help of Jackson Lee, a resident of the swamp, I trapped here several specimens of *Neofiber allenii*.

The surface of Floyd's Island Prairie is largely occupied by sphagnum. Among the other plants growing here are "little-bladed saw-grass"² (*Scleria trichopoda?*), maiden-cane (*Panicum hemitomon*), "cat-tail" (*Erianthus saccharoides*), fern (*Anchistea virginica*), pitcher plant (*Sarracenia minor*), "hardhead" (*Xyris fimbriata*), a sedge (*Dulichium arundinaceum*), marsh St. John's-wort (*Triadenum virginicum*), and a bog herb (*Syngonanthus flavidulus*). In the more open parts of the prairie, such as the "runs" and the "gator-holes," "bonnets" (*Nymphaea macrophylla*) and "never-wets" (*Orontium aquaticum*) are common. "Little-bladed saw-grass" seems to enter chiefly into the construction of the upper part of the nest, and maiden-cane also is used. One fresh nest was made largely of fibrous roots, with a covering of maiden-cane. The foundation of another consisted of roots and coarse, matted vegetation. One of the homes was situated in a clump or tuft of "cat-tail" (*Erianthus*), and another among broom-sedge and maiden-cane. The foundations rested on top of the sphagnum rather than in the water. The water-level on the prairie at this time, however, was

¹ Cf. Wright and Harper, A Biological Reconnaissance of Okefenokee Swamp: The Birds. *The Auk*, XXX, October, 1913, pp. 477-505.

² Names in quotes are those in local use in the swamp.

somewhat lower than usual. The nests, though not exactly measured, were probably about 12 to 18 inches in diameter, and 10 to 15 inches high.

There is comparatively little open water on the prairie, and *Neofiber* here seems to be a bog inhabitant rather than an aquatic animal. Its runways lead away from the nests over the sphagnum and peat, among the stems of fern and maiden-cane. Water stands in the runways in places, but for the most part is hardly deep enough to cause the animals to swim. Here and there the runways become tunnels through the sphagnum; and one may also see where the animals have made diggings down into the bog, evidently in search of roots. Lee discovered some fern (*Anchistea*) roots that had been chewed, and we sampled them ourselves. They tasted tolerably good, suggesting a raw peanut, and were quite slippery to the tongue.

The nest chamber is in effect an anticlinal tunnel connecting with runways on opposite sides of the nest. The entrances are about at the water-level. The floor of the tunnel at its middle part, while elevated above the water-level, is not necessarily dry. In some, but by no means all, of the nests, the middle part of the tunnel was occupied by a little bed of soft and fairly dry vegetation, distinct from the mass of the nest. Perhaps these are places for the reception of the young. On January 5 my companion found in a nest two small and scantily haired young ones, with eyes not yet open. In one case the upper part of a *Neofiber* house was found to contain a little nest of finer material, evidently belonging to a rice rat (*Oryzomys palustris palustris*) which was trapped there.

We found other nests on Cowhouse Prairie and on Chase Prairie. Notwithstanding the evident abundance of the animals, we caught no glimpse of them at their nests or elsewhere. Apparently they are very shy. In the Okefenokee vernacular they are known as "prairie rats" or "water rats."



FIG. 1. FLOYD'S ISLAND PRAIRIE, OKEFINOKEE SWAMP; THE HAUNT OF
NEOFIBER ALLENI
May 22, 1912. Francis Harper



FIG. 2. RUNWAY OF NEOFIBER ALLENI AMONG SPHAGNUM AND FERN
Floyd's Island Prairie, Okefinokee Swamp. January 6, 1917. Francis Harper
(Harper: Florida Water-Rat in Georgia.)

FOR A METHODIC STUDY OF LIFE-HISTORIES OF MAMMALS

BY ERNEST THOMPSON SETON

For long I have believed in and used a prepared schedule for methodic study of life-histories. It has been my lot many times to find a man who did not know how much he knew about a given animal until he was subjected to the dragnet of a schedule process, and the results were surprising and satisfactory, to himself as well as to the questioner.

How much we have lost for lack of this, it would be easy to show. I happen to have before me Audubon and Bachman's account of the northern graysquirrel. The subjects treated in the various sections of its 12 pages are in the following order:

Name	Food
Description	Numbers
Characters	Enemies
Synonyms	Migrations
Description	Numbers
Color	Food
Varieties	Distribution
Measurements	Comparative description
Habits	Various names
Nesting	Description
Pairing	Young
Young	Description
Habits in captivity	Measurements
Rutting season	Distribution
Combats	Color
Food hoards	Description

That is to say there is no attempt at arrangement—no orderly approach; the chapter is merely a mass of undigested observations and raw material; and he has omitted a score of important matters that he certainly knew about. Bachman did justice neither to the graysquirrel, nor to himself. He certainly had ten times the facts about the creature, that one might suppose from his article; and the reason he did not set them down, was I think, because he had no plan of orderly approach. We find this defect in most available life-histories. It seems to me it would be remedied, if each naturalist set out with a plan, such as the one I give herewith, and please understand that this is a mere suggestion. For over twenty years I have used it myself but am ready to drop it as soon as a better one is offered.

PLAN FOR MAKING OBSERVATIONS

Identification (Name)

Names, scientific, English, aboriginal.
Description, generic, specific, subspecific, comparative and anatomical.
Literary history.

Environment (Place)

Range of the species with outlying records, and known changes of same.
Environment or habitat of the species.
Relation to other species of animals or plants.
Home-range of the individual, extent, etc.
Migrations.
Erratic movements.

Physical facts (Body)

Numbers or population, primitive and present.
Senses or special equipment.
Cycles of increase, etc.
Abnormalities, freak developments.
Coat, moults, etc.
Glands.
Protective and directive marks and tricks.
Speed, usual and fast.
Swimming.
Tracks in various gaits.
Scatology, evidence of.
Sanitation in general and in nest.
Bathing.
Sand baths.
Sun baths.
Medication.
Food, full details, commensalism, parasitism, etc.
Storage habits.

Habits (Mind)

Diurnal or nocturnal.
Mating ceremonies.
Marriage, form, duration, etc.
Home-building, kind and number of homes.
Do they make nests or bowers never used for their young?
Gestation.
Young, number, development, family life, relation of father to young.
Do old males become hermits?
Sociability.
Gregarious or not.
Disposition or temper.
Amusements or games.
Aesthetic instincts, love of beautiful, etc.
Curiosity.
Communication, etc.

Modes of signalling.

Voice, various calls and their meaning.

Song, love songs.

Property-instinct.

Hibernation and torpidity.

Habits in captivity.

Morality, vice, crime, suicide, etc.

Enemies, etc.

Diseases and natural mode of treating, etc.

Parasites, internal and external.

Insect pests, and mode of combating.

Rivals.

Enemies of other kinds and modes of defeating.

Age attained, breeding age, etc.

Death of most, due to what?

Strange Instances

Odd partnerships with birds or other creatures.

Unexplained instances.

Abnormalities.

Economics

Service or relation to man.

In all cases give name, place and date. The omission of these have rendered useless a great number of records.

While the above seems a logical sequence, it will frequently prove better to rearrange it for special animals or materials, but each species should be considered under each head, and under other heads suggested by circumstances.

IDENTITY OF THE BEAN MOUSE OF LEWIS AND CLARK

BY VERNON BAILEY

For over a century the ground beans or wild peanuts taken by the Indians of the upper Missouri Valley from the caches of some little animal have been known and made use of by travellers, explorers, and naturalists, but the animal which laid up these valuable food stores has only recently been identified. It proves to be an unnamed meadow mouse of the *Microtus pennsylvanicus* group.

In 1804 Lewis and Clark obtained from the "Ricaras" (Arikara Indians) "a large rich bean which they take from the mice of the prairie which discover and collect it."¹ Later they reported artichokes taken from the stores of mice by their Indian woman, and while Coues in a footnote credits these stores to pocket gophers, they were more probably the collections of the mice² which commonly store the beans, artichokes, and other roots together in underground cavities. Other explorers give passing mention to the mouse stores used by the Indians as food, and writing in 1845 Father De Smet says: "The earth pea and bean are also delicious and nourishing roots found commonly in low and alluvial lands. The above named roots form a considerable portion of the sustenance of these Indians during winter. They seek them in places where mice and other little animals, in particular the ground squirrel, have piled them in heaps."³

The extent to which these beans have been used by the Indians as food is evidently greater than has been generally supposed. Some of the Dakotas at Cannon Ball, North Dakota, have told me of gathering several bushels each autumn from the mouse stores, and both Indians and whites greatly prize them as a rich and delicious food. They are large, fleshy beans produced on underground shoots of a trifoliate bean vine, *Falcata comosa*.

The artichokes stored with the beans are the tubers of a wild sunflower (*Helianthus tuberosa*) also growing abundantly on the rich bottom-lands of the river valleys. They too are a valuable food and much used by the Indians, and are gathered from the ground where they grow as well as from the mouse collections.

¹ Lewis and Clark Journals, Coues, Vol. I, p. 161, 1893.

² Lewis and Clark Journals, Coues, Vol. I, p. 263, 1893.

³ Life and Travels of De Smet, Vol. II, p. 655, 1905. See also Dr. Melvin R. Gilmore, Uses of Plants by the Indians of the Missouri River Region. Ann. Rept. Bur. Amer. Ethnology for 1911 and 1912, p. 95, 1919.

All efforts to determine which of the fifteen species of so-called mice of that region was responsible for the storing of the beans and artichokes have previously failed. Neither Indians nor white men who were familiar with the mice and their stores could agree on which was the storer even when they were shown specimens of all the species of mice, and their descriptions differed so widely as to add confusion rather than enlightenment.

The Biological Survey field work in North Dakota has usually closed before the storing season begins, but in 1919 the work was so planned that I could remain late and make a special effort to get the mice with their stores. On October 30, at Cannon Ball, I found a small cache of beans and artichokes which I secured and also the mice with them. One was caught in a trap in a runway leading to the cache and one was taken alive in my hands as it ran out of the cavity where the stores were found not far from a soft nest, a few inches below the surface of the ground.

While several other small rodents may also store the beans and artichokes the indications point to this as the one principally concerned in the accumulation of such food stores as are found along the Missouri River valley. Many specimens of these mice had been previously collected, so it was only necessary to connect the species with the stores, and somewhat to my surprise it proved to be a previously unrecognized subspecies of which I already had a description in manuscript. Fortunately this discovery was made in time to give the new form the name long used for it by the Indians.

In working out the range of the *Microtus pennsylvanicus* group in North Dakota, I find specimens from numerous localities from the western part of the State that can not reasonably be referred to the large dark *M. p. pennsylvanicus* of the Eastern States, the little form *M. p. drummondi* of Canada and central North Dakota, nor to the dark gray *M. p. modestus* of the Rocky Mountain Region, although these three forms approach and evidently intergrade. A large pale form, most resembling *modestus*, is found to occupy the badland region of western North Dakota and eastern Montana. It occupies an extensive and well defined faunal subdivision of the Upper Sonoran and Transition Zones in the arid badland area of the northern Great Plains. While the limits of its range have not been fully worked out, the most typical and strikingly marked specimens are from the sagebrush and badland area of the Upper Missouri and Yellowstone Valleys. My first acquaintance with the species was in 1913, when on the side of a badland butte

west of the Missouri River, about 10 miles south of Williston, I caught a specimen which I could not identify. Other specimens in the Biological Survey collection taken at Sentinel Butte, Glen Ullin, Oakdale, Fort Clark, Mandan, Bismarck, and Cannon Ball, in North Dakota; and at Glendive, Wibaux, Ekalaka, Capitol, Elgin, Johnson Lake, near Highwood Mountains, Billings, and Fort Custer in Montana, prove to be of this form. The large series and broad range represented enables me to select a type from a central locality where the characters are comparatively uniform. The subspecies may be known by the following description:

***Microtus pennsylvanicus wahema*⁴ subsp. nov.**

BEAN MOUSE

Hetunka of the Dakota Indians (Drs. Beede and Gilmore).

Type, from Glendive, Montana. No. 212370, U. S. National Museum, Biological Survey collection, adult male. Collected by Remington Kellogg, May 8, 1916. Collector's No. 425.

General characters.—In size slightly smaller than *Microtus pennsylvanicus* or *M. p. modestus* and with relatively narrower skull. Conspicuously larger than *M. p. drummondi* and with relatively heavy skull compared with the very delicate, slender skull of that species. Paler than any other member of the group except *M. breweri* of Muskeget Island, which it closely resembles in the general ashy gray tone.

Color.—In short, fresh, summer pelage, back buffy gray; sides clear gray or slightly tinged with buff; under parts, feet, and lower surface of tail light gray or buffy white; upper surface of tail dusky gray. *Winter* pelage long and soft with buffy gray tips to the hairs of upperparts; underparts white or slightly creamy; tail sharply bicolor. In faded winter pelage, color ashy gray with little trace of buffy tinge. *Young* buffy gray, but little darker than adults, except the tails and feet which are more plumbeous.

Cranial characters.—Skull noticeably narrower and slenderer than in *pennsylvanicus* and *modestus*, but almost as long and quite as heavy in structure. Both the braincase and the zygomatic arches are noticeably compressed to give the skull its narrow appearance.

Measurements of type specimen.—Total length, 178 mm., tail vertebræ, 43; hind foot, 20. *Skull*: basal length, 27; nasals, 7.6; zygomatic breadth, 15.4; mastoid breadth, 13; alveolar length of upper molar series, 6.8.

⁴ Omaha name meaning "to bury," given on the authority of Dr. Melvin R. Gilmore. *Intshunga wahema* "the burying mouse," from this habit of storing food.

A NEW FOSSIL RODENT FROM THE OLIGOCENE OF SOUTH DAKOTA¹

BY GERRIT S. MILLER, JR., AND JAMES W. GIDLEY

Among some fragmentary jaws of *Ischyromys* from the Bad Lands of South Dakota two species are represented; a large-toothed animal resembling *Ischyromys typus* Leidy, but probably related to *Ischyromys chrysodon* (Cope), and a small-toothed form which may be named and described as follows:

Ischyromys parvidens sp. nov.

Type.—Imperfect right mandibular ramus containing all four cheekteeth (pm_4 in place, moderately worn), No. 9134, U. S. National Museum. Collected in the Oreodon Beds of the White River Oligocene, "Bad Lands," Washington County, South Dakota, by J. B. Hatcher.

Diagnosis.—Mandible and teeth in general like those of *Ischyromys typus*, but teeth relatively smaller, the length of the entire toothrow about equal to that of three teeth of the larger animal.

Mandible.—In form the mandible agrees with that of *Ischyromys typus*. It is not thickened as in the species which we suppose to be related to *I. chrysodon*, nor reduced in depth as in *Titanotheriomys veterior*. Region of masseter attachment resembling that of *I. typus* in the position of its anterior border, beneath hind margin of m_1 , and in the relative distinctness of its outline (more clearly defined than in the other large-toothed species).

Teeth.—Incisor, so far as can be judged from the fragments, robust like that of the other members of the genus, not slender as in *Titanotheriomys*. Its posterior termination lies against the inner surface of outer wall of the base of the ascending ramus, at alveolar level and separated from posterior border of m_3 by a space about equal to the length of this tooth. In *I. typus* the incisor appears to end at the same point in the jaw, but the large size of the cheekteeth brings the posterior border of m_3 back nearly to a level with it. Size of cheekteeth both actually and relatively much less than in *Ischyromys typus* and resembling that in *Titanotheriomys veterior*. The length of the toothrow slightly exceeds the depth of the mandible at front of m_1 while in *I. typus* it is about one and one-half times this depth. The enamel pattern shows no important peculiarities.

Specimens examined.—Five imperfect mandibles.

Remarks.—The only described member of the family *Ischyromyidae* in which the teeth are as small as those of *Ischyromys parvidens* is the *Titanotheriomys veterior* of Matthew. In this animal the lower jaw is noticeably more slender than in any of the known species of *Ischyromys*. Hence there should be no difficulty in distinguishing between fragmen-

¹ Published here by permission of the Secretary of the Smithsonian Institution.

tary mandibles. While the material which we have examined is not sufficient to form the basis of a revision of the group it indicates the existence of at least four species as shown in the following key:

Length of first three molariform teeth about	$\frac{8.5}{8.5}$
Depth of mandible at middle of m_2 , about 8.....	<i>Titanotheriomys veterior</i>
Depth of mandible at middle of m_2 , about 10.....	<i>Ischyromys parvidens</i>
Length of first three molariform teeth about	$\frac{10.0}{10.0}$
Area of muscle attachment in front of antero-external root of pm^4 a well defined, rounded pit.....	<i>Ischyromys chrysodon</i>
Area of muscle attachment in front of antero-external root of pm^4 an ill defined shallow depression.....	<i>Ischyromys typus</i>

The form described by Cope as *Colotaxis cristatus* appears to have been based on jaws of *Ischyromys typus* with the narrow-crowned milk premolar in place. We have not seen jaws of true *Ischyromys chrysodon* from Colorado, but those of the nearly related and perhaps identical species occurring in the Bad Lands differ from those of *Ischyromys typus* in their obviously greater breadth; about 7-8 mm. instead of about 5.5 mm. at level of posterior cheektooth.

THE STATUS OF PENNANT'S "MEXICAN DEER"

By WILFRED H. OSGOOD

[Plate 4]

In a brief paper in 1902,¹ I attempted to show that Gmelin's name *Cervus mexicanus*, based on Pennant's Mexican Deer, should be used for the white-tailed deer of the Valley of Mexico. My belief that the name should be regarded as identifiable was based on giving primary importance to Pennant's description and figure of an actual specimen, while Dr. J. A. Allen,² who proposed discarding the name as unidentifiable, gave preference to Pennant's first citation, the Teuthlalmaçame, of Hernandez. Since there is still no uniformity of usage in regard to the name and especially since I am now able to present a photograph of Pennant's specimen, it seems advisable to restate and amplify my former contention.

In 1771, Pennant,³ under the vernacular name MEXICAN DEER, published the following description:

D. [eer] with strong thick rugged horns, bending forward; ten inches long; nine between point and point; trifurcated in the upper part; one erect snag about two inches above the base: by accident subject to vary in the number of branches: head large: neck thick: eyes large, and bright: about the size of the European Roe: color of the hair reddish; when young spotted with white.

Inhabits *Mexico*, *Guiana*, and *Brazil*; not only the internal parts of the country, but even the borders of the plantations: the flesh inferior to that of *European* venison. A species very distinct from the Roe of the old continent.

This description was accompanied by a woodcut of a frontlet and pair of antlers showing the characters mentioned and making it perfectly obvious that both description and figure were taken from an actual specimen examined by the describer. There were in addition, as customary, a number of citations of earlier authors including those which Pennant supposed to be based upon the same species of deer as the one he himself had described.

In dealing with names based solely upon citations, it has been the practice to regard one as the primary reference, this usually but not always being the first one, and if this proves satisfactorily identifiable, slight discrepancies in the remaining ones have been disregarded. A

¹ Proc. Biol. Soc. Washington, 15, pp. 87-88, Apr. 25, 1902.

² Bull. Am. Mus. Nat. Hist., 16, p. 16, footnote, Feb. 1, 1902.

³ Synopsis of Quadrupeds, p. 54, pl. 9, fig. 3.

specimen, however, always takes precedence over a citation, unless the description is so drawn from both as to involve a mixture of contradictory or impossible characters. In Pennant's description, there is no incompatible statement⁴ and it seems clear that the primary basis of names later applied to it is unquestionably the specimen. This specimen is still in existence in the British Museum where I personally examined it a number of years ago in company with Mr. Oldfield Thomas and Mr. Richard Lydekker who brought it to my attention. At that time I secured the photographs of it reproduced herewith. Its agreement with the figure published by Pennant and with a subsequent one by Hamilton Smith⁵ is not absolute in every detail but furnishes such a close approximation as to leave no doubt of its identity. This then is in effect the type specimen and the principal basis of the technical name *Cervus mexicanus* which was first used by Zimmermann in 1777 and later by Gmelin in 1788. It was adopted, principally from Gmelin, by later authors, almost without question, down to 1902 when Allen discarded it as unidentifiable.

The abnormality of the type specimen is of a very common sort among various forms of the white-tailed deer and consists in an increased number of points and unusually heavy beams. The specimen, therefore, is not unidentifiable except in the narrowest sense. As a member of the "virginianus" series of American deer, that is, the white-tailed deer, its identity is unquestionable and, if the name be taken from Zimmermann, as now seems necessary, it is earlier than any other except *virginianus*, to which it yields only page priority.

In the absence of proof to the contrary, it seems necessary to accept Pennant's belief that the specimen came from Mexico. Hence the name must be applied to some form of white-tailed deer from that country. The first use of the name in connection with specimens from a definite locality was that of Lichtenstein in 1827, his specimens being from the Valley of Mexico. Therefore, I proposed in 1902 that this locality be regarded as restrictively used by Lichtenstein. In effect, I designated a type locality, Lichtenstein merely furnished the

⁴ If anything was derived from Hernandez, it was doubtless from the text of that author, which, as noted by Lydekker (*Deer of All Lands*, p. 263, 1898), applies exclusively to a deer, only the figure being composite.

⁵ In both figures the antlers are curiously reversed, the right being in the position of the left.

suggestion.⁶ This designation, however, is subject to revision if the type proves to belong to a larger form than the one of the Valley of Mexico. Without direct comparison of specimens, it is unsafe to draw definite conclusions, but it seems very probable that the type will prove inseparable from similarly developed specimens of one of the larger, more northern forms, as the Texan or possibly the Louisianan deer, either of which could come under a broad interpretation of "Mexican." This is a matter for decision by the future monographer of the entire group of white-tailed deer. The following measurements were taken from the type: Length of beam over curve, 570 mm.; circumference above burr, 165 mm.; distance between anterior points, $8\frac{3}{4}$ —9 inches.

Important citations connected with the history of the names are as follows:

Odocoileus mexicanus ZIMMERMANN

Mexican Deer PENNANT, Synopsis Quad., p. 54, pl. 9, fig. 3, 1771; Hist. Quad. 1, p. 110, pl. fig. 3, 1781—type in British Museum.

Cervus (vel potius) Capreolus mexicanus, ZIMMERMANN, Spec. Zool. Geogr. Quad., p. 533, 1777—based on Pennant.

Cervus mexicanus GMELIN, Syst. Nat., 1, p. 179, 1788—based on Pennant; DESMARET, Mamm., 2, p. 444, 1822—"cette espèce, qui n'est encore comme que par ses bois extrêmement rugueux;" LICHTENSTEIN, Darst. neuer Säugeth., p. 18 and text, 1827—Gmelin's name adopted for specimens from Valley of Mexico; HAM. SMITH, Griffith's Cuv., Anim. Kingd., 4, p. 130, pl. opp. p. 94, fig. 3, 1827—Pennant's type refigured.

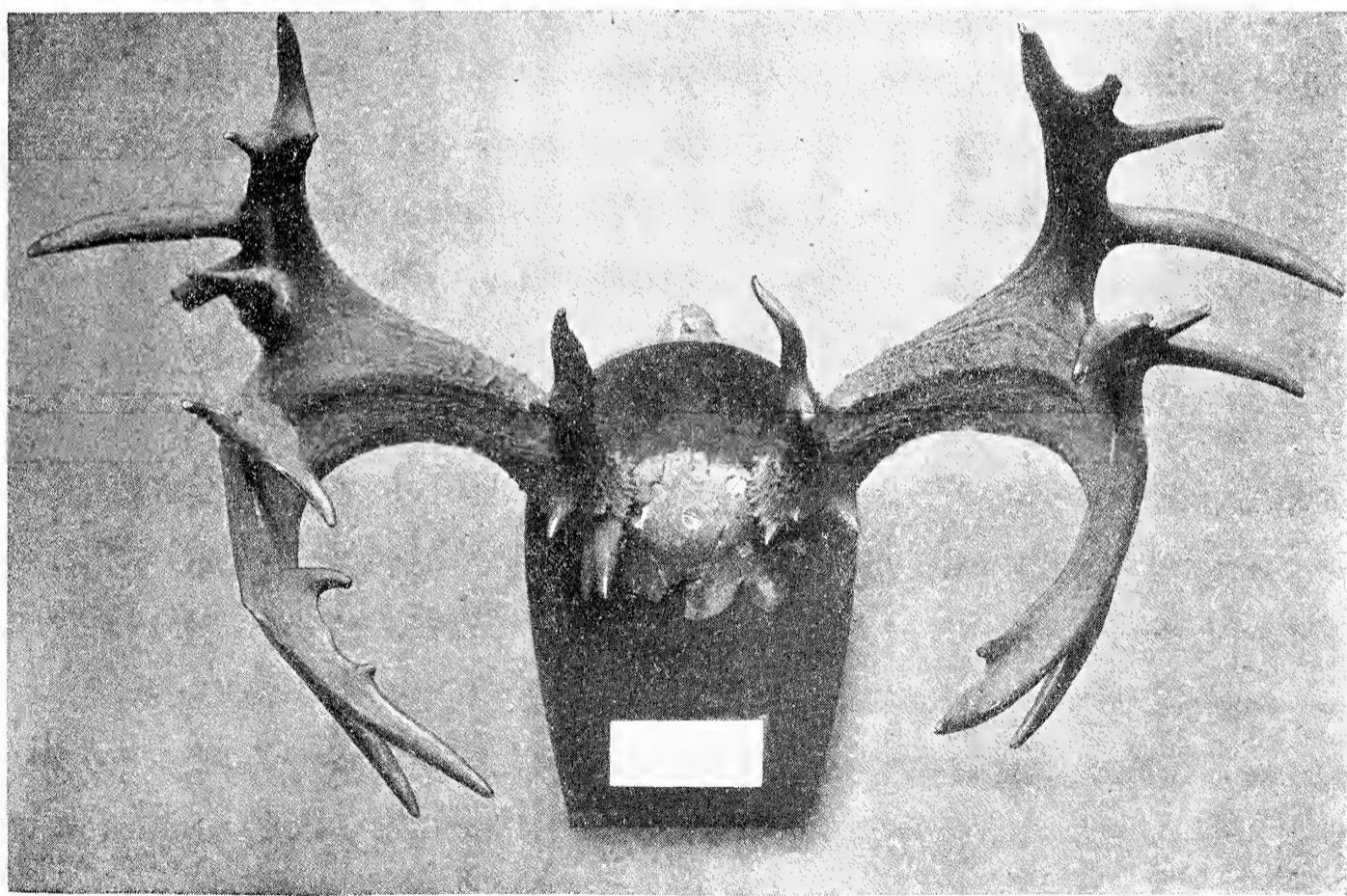
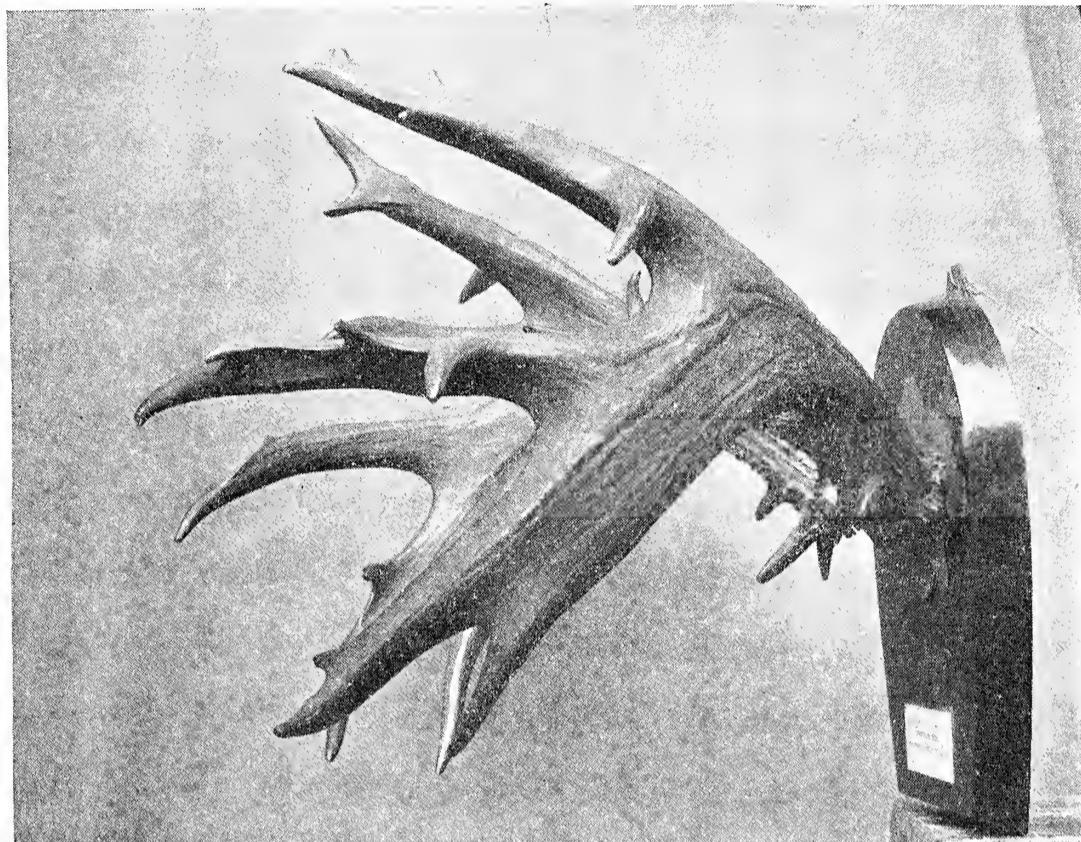
Cariacus mexicanus LESSON, Nouv. Tabl. Anim., Mamm., p. 173, 1842; GRAY, Cat. Rumin. Mamm. Brit. Mus. p. 83, 1872—under *C. leucurus*, where it is stated "The horns figured by Pennant are in the British Museum, and were refigured by Hamilton Smith;" BROOKE, Proc. Zool. Soc. Lond. p. 919, 1878—horns figured by Pennant regarded as probably those of "*Cariacus macrotis*;" ALSTON, Biol. Cent. Amer., p. 113, footnote, 1879—"It seems to me more probable that these antlers belonged to *C. leucurus* (Dougl.) which recent American zoologists consider to be a local race of *C. virginianus*; they much resemble the remarkable Nebraska head figured by Baird (Mamm. N. Am. p. 652, fig. 18)."

Cariacus virginianus mexicanus RHOADS, Am. Nat., 28, p. 524, 1894.

Mazama americana mexicana LYDEKKER, Deer of All Lands, p. 261, 1898.

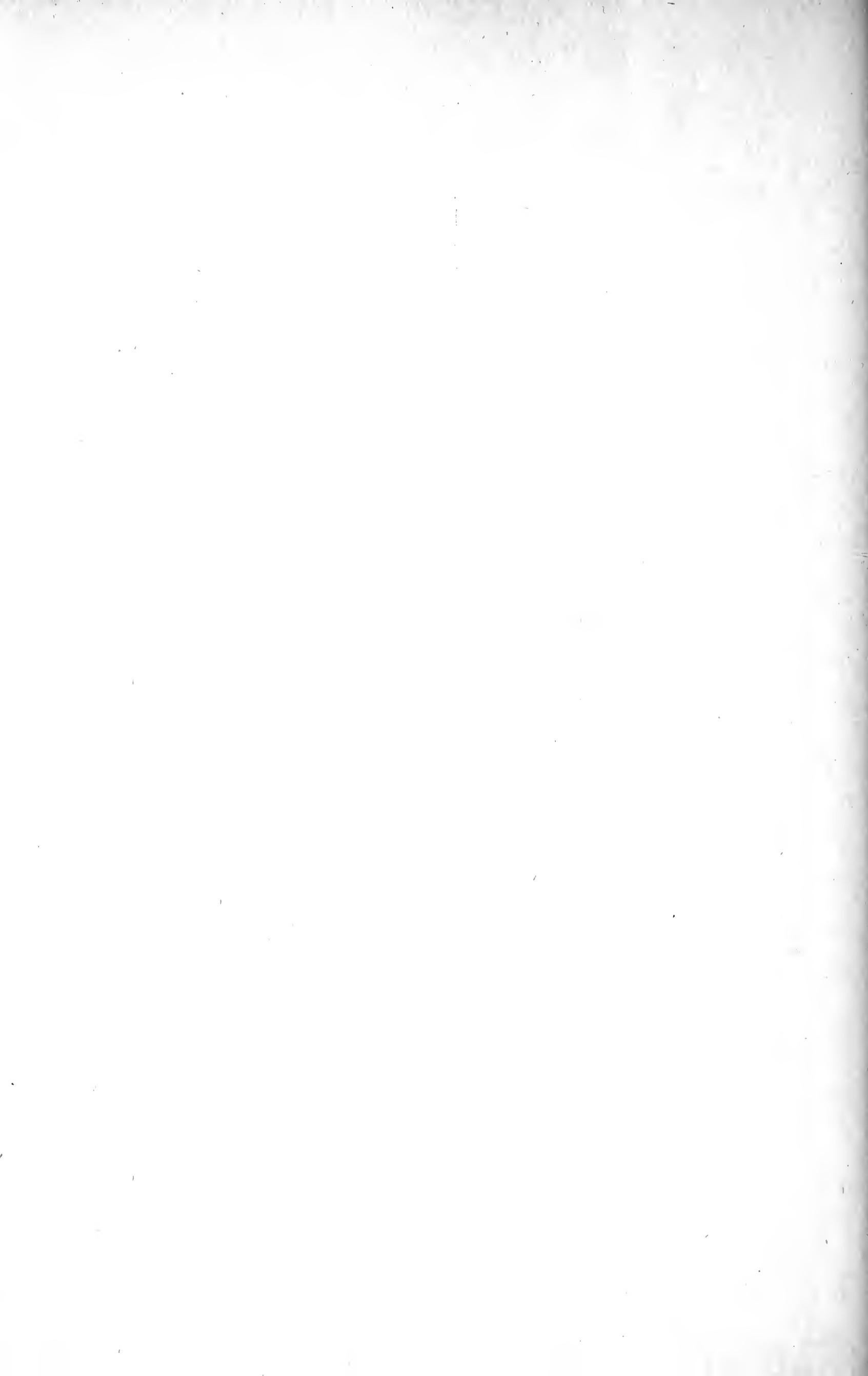
⁶ It was not intended as some have supposed, that the name should date from Lichtenstein. Compare Allen, Bull. Amer. Mus. Nat. Hist., 16, p. 161, July 1, 1902; Miller, Bull. 79, U. S. Nat. Mus., p. 389, 1912; Lydekker, Catal. Ungul. Brit. Mus., 4, p. 165, 1915.

- Dama lichtensteini* ALLEN, Bull. Amer. Mus. Nat. Hist., 16, p. 20, Feb. 1, 1902—
Cervus mexicanus of Lichtenstein renamed.
Odocoileus mexicanus OSGOOD, Proc. Biol. Soc. Wash., 15, p. 88, Apr. 25, 1902;
MILLER AND REHN, Proc. Bost. Soc. Nat. Hist., 31, p. 16, Aug., 1903; MILLER,
Bull. 79, U. S. Nat. Mus., p. 389, 1912.
Odocoileus virginianus LYDEKKER, Catal. Ungul. Brit. Mus., 4, p. 165, 1915—
Pennant's type listed as No. 681, e.



OODOCOILEUS MEXICANUS. TYPE SPECIMEN

(Osgood: Pennant's Mexican Deer.)



DESCRIPTION OF A NEW RACE OF THE FLORIDA WATER-RAT (NEOFIBER ALLENI)

BY ARTHUR H. HOWELL

Attention has already been called by Bangs to the differences existing between typical *Neofiber allenii* of the east coast of Florida and the form inhabiting the fresh water lakes of the interior of the State.¹ Acquisition of a considerable series of specimens from the shores of Lake Okeechobee confirms this opinion and shows the necessity for recognizing this form by name. It may be described as follows:

***Neofiber allenii nigrescens* subsp. nov.**

EVERGLADE WATER-RAT

Type, No. 228,392, U. S. National Museum, Biological Survey collection; adult ♂, skin and skull; from Ritta, Florida (south shore Lake Okeechobee), March 2, 1918; collected by A. H. Howell; original number, 2269.

Subspecific characters.—Similar to *N. allenii allenii*, but coloration more blackish (less brownish) above and more whitish (less buffy) below.

Color.—General tone of upperparts fuscous-black, sometimes with a slight brownish tinge; sides paler, sometimes faintly washed with buffy wood brown; feet fuscous; tail fuscous-black; underparts grayish white, faintly washed with avellaneous, the chin with an irregular patch of fuscous or hair-brown. Young individuals are even darker than adults, being uniform chætura-black above.

Skull.—Not appreciably different from that of *allenii*.

Measurements.—*Type*: Total length, 328; tail vertebræ, 127; hind foot, 44. *Skull*: Basal length, 43.2; condylo-basal length, 44.8; zygomatic breadth, 27.4; length of nasals, 12; alveolar length of maxillary tooth row, 11.5.

Remarks.—This new race of the Florida water-rat or round-tailed muskrat is represented by a series of 25 specimens from southern Florida; nearly all are from the type locality—Ritta, on the south shore of Lake Okeechobee—but two are from Canal Point on the eastern shore, at the mouth of the West Palm Beach Canal, one from Zona on the North New River Canal, near Fort Lauderdale, and one from the head of Barnes River on the west coast near Chokoloskee. The species doubtless ranges locally throughout the Everglade region, south to Cape Sable, where, on a burnt marsh within half a mile of the coast I picked up several weathered skulls of the animal.

¹ Bangs, O., Proc. Boston Soc. Nat. Hist., Vol. 28, p. 183, 1898.

The habits of this race are quite unlike those of typical *alleni*, as described by Chapman² and Bangs.³ In the Okeechobee region the animals are found, not in ponds or marshes, but in dry or moist peat at a considerable distance from the lake shore. Before the lowering of the lake by drainage canals, however, the water must have extended close to the areas occupied by the rats and probably at times overflowed them.

I could get no positive evidence, however, that these rats ever built houses in the water, as *alleni* is known to do. Their burrows or tunnels were found in both neglected and cultivated fields, in cane patches, and even in dooryards and gardens. In the largest colony discovered, the tunnels ramified the friable peat soil in all directions, but apparently extended to no great depth; only small mounds of peat were found about the entrances. The rats were easily caught in unbaited steel traps or in Schuyler rat traps baited with banana.

In a small, brackish marsh at the head of Barnes River, about 8 miles east of Chokoloskee, I found a small colony of these water-rats and trapped a single specimen. This is the first record from the west coast of Florida, but residents stated that the animals are abundant in similar situations near the head of Turner's River and doubtless all the way down to the coast to Cape Sable. At this locality their tunnels were in wet muck in a part of the marsh containing a dense growth of switch grass with much of the old growth matted down on the ground. Good-sized piles of muck had been scratched out of some of the burrows and in a few cases the holes had been plugged with a round ball of soft muck. Deep trails led from one hole to another, but I could not find that any trails led to the pond a few yards away where cat-tail flags grew abundantly. Many pieces of flag stems, presumably cut by the rats, were floating on the water.

² Chapman, F. M., Bull. Am. Mus. Nat. Hist., II, pp. 119-122, 1889.

³ Bangs, O., Proc. Boston Soc. Nat. Hist., Vol. 28, pp. 182-183, 1898.

NEW RODENTS AND NEW BATS FROM NEOTROPICAL REGIONS

By H. E. ANTHONY

Upon taking up work on collections of South American mammals accumulated in the American Museum during the past three years, several apparently undescribed forms have been discovered. They are hereby set forth in a preliminary paper, pending a detailed report on the entire collections which will be delayed for some months.

Acknowledgment is made of the kind loan of comparative material by Mr. Gerrit S. Miller, Jr., Curator, Division of Mammals, United States National Museum.

Microsciurus septentrionalis sp. nov.

Type, No. 41235, Dept. of Mammalogy, ♀, Sabalos, on Rio San Juan at junction of Rio Sabalos, Nicaragua, May 12, 1917; collector, Wm. B. Richardson.

Characters.—Similar to *M. alfari* in general appearance but with less rufescent pelage, above and below, and with post-palatal region noticeably longer and molar teeth smaller.

Color.—Upperparts presenting a grizzled olivaceous appearance, the hairs slate black at the base and tipped with honey yellow, top of head slightly more ochraceous; underparts warm buff; tail, above mixed cinnamon-rufous and black, the hairs being banded with alternate bands of each color and tipped with a yellow shade more like that of the light tipped hairs on the back, below very much as above.

Skull.—Like that of *alfari* but with longer palate, the post-palatal notch not reaching to plane of last molars.

Measurements (taken in the flesh).—Total length, 240 mm. (250);¹ tail vertebræ, 100 (120); hind foot, 30 (30); hind foot measured from dry skin, with claws, 37 (37.3). Skull, occipito-nasal length, 33.7; zygomatic breadth, 21.6; breadth of braincase, 18.1; interorbital breadth, 14, length of nasals, 10; length of maxillary toothrow, 5.3.

The Nicaragua squirrel presents rather a puzzling problem as to affinities. Logically it should be closely related to *alfari*, the type locality of which is about 80 miles to the south, but in some characters it more closely resembles *isthmius vivatus* from Panama. The type of coloration of *septentrionalis*, olivaceous in general appearance, is well contrasted with the ferruginous pelage of *alfari* (type specimen) but compared with *isthmius vivatus* this difference is not very great in either the upper or lower parts.

¹ Measurements in parentheses are of topotype.

In skull characters *septentrionalis* more nearly resembles *isthmius vivatus*, as these two forms, of all the Central American *Microsciurus*, alone have the post-palatal region extending beyond the plane of the last molar. This extension of the palate serves to separate *septentrionalis* from all forms but *isthmius vivatus*, but from this latter it is separated by smaller molars.

But two specimens of this squirrel were taken, both at Sabalos, ♂ and ♀.

Dactylomys boliviensis sp. nov.

Text figures 1 and 2

Type, No. 38709, Dept. of Mammalogy, ♀, Mission San Antonio, Rio Chmore Prov. Cochabamba, Bolivia; altitude 1300 feet, August 18, 1915; collectors, Leo E. Miller and H. S. Boyle. The type is a well prepared skin with a perfect skull, fully mature and with molar crowns well worn.

General characters.—Similar to *D. dactylinus* but somewhat smaller and coloration a uniform olivaceous gray.

Color.—Upperparts, from between ears to base of tail, clothed with very long, lax hairs which are black at the base for three quarters of their length or more, and are tipped with buffy brown along the back and olive-buff on the sides, the general effect being difficult to describe but giving a distinctly olivaceous impression in most lights; crown with a patch of long clove brown hairs that form a sort of a hood extending as far as the ears; vibrissæ very long and black; underparts white to cream colored with narrow encroachments of the grizzled hair from the sides. Forelegs above, like rest of upperparts; below, like breast. Hind limbs, along inside and upper surface, cinnamon buff; below like belly. Tail very long, practically naked and scaly except for space of about 60 mm. at the base, where the long hair of the back extends down onto the tail and is black in color, the tips of the hairs cream color.

Detailed characters.—Toes, five² in front, five behind. Ears small, sparsely haired, almost hidden in long hair of head. Eyes small, with a tuft of long vibrissæ arising just posterior to the eye.

Skull.—Large and strongly built; nasals widening rapidly anteriorly, terminating almost in same plane with premaxillæ; superior outline of skull very flat; maxillary toothrows converging anteriorly almost to the midline; posterior portion of palate built out by a thin shelf-like extension of post palatal region; pterygoid processes very long, slender and meeting the auditory bullæ; other skull characters and mandible normal for the genus.

Measurements (taken in the field).—Total length, 710 mm.; tail vertebræ, 410; hind foot, 60; greatest length of skull, 74.1; condylobasal length, 70.6; zygo-

² The fifth toe of the fore foot is so small that a lens is required to distinguish it with certainty. It consists mainly of a vestigial claw set in the plantar tubercle that formerly lay at the base of that toe.

matic breadth, 34; length of nasals, 21.5; greatest breadth of frontals, 22.5; greatest breadth of braincase, 23.2; length of palate, postpalatal notch to posterior border of incisive alveolus, 35.2; length of molar toothrow, 17.7; greatest length of mandible, 51.2; length of mandibular molar series, 18.3.

This new form of *Dactylomys* is noticeably different from the one specimen of *D. dactylinus* in the museum collections, and as nearly as I can judge from the literature on the genus, from any hitherto described form. A specimen of this genus, taken at Villavicencio, eastern

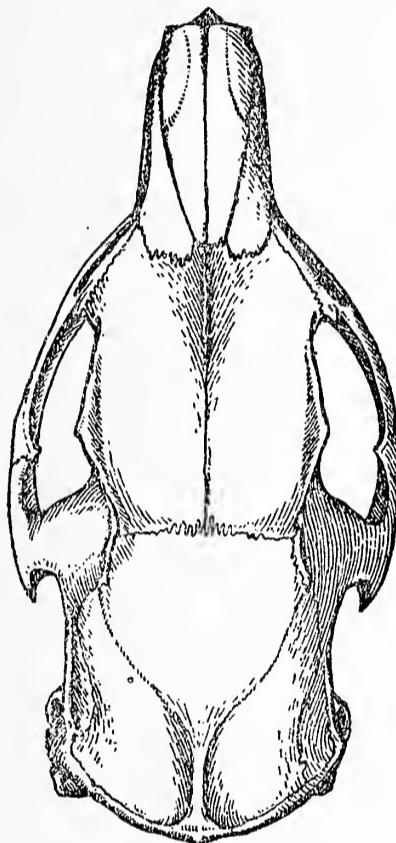


FIG. 1. TYPE OF DACTYLINUS BOLIVIENSIS, No. 38709, NATURAL SIZE

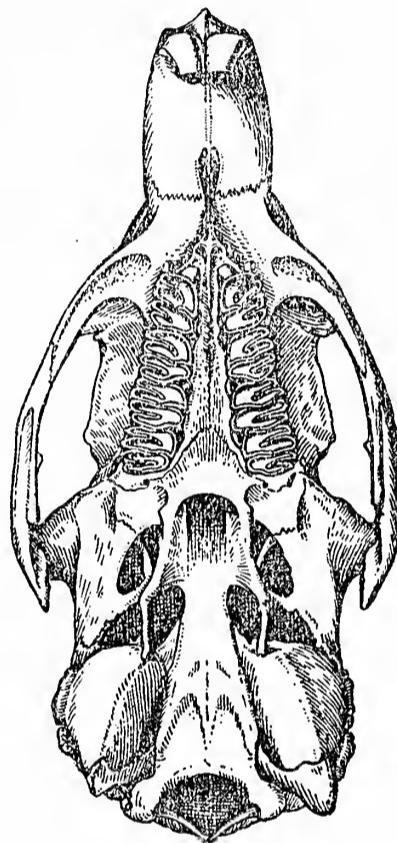


FIG. 2. TYPE OF DACTYLOMYS BOLIVIENSIS, No. 38709, NATURAL SIZE

base of the Andes, Colombia, was identified by Doctor Allen³ as *dactylinus*, with which it agrees in all characters of specific importance as well as can be expected when the basis for comparison is the short type description of Desmarest.⁴ Later authors have not extended Desmarest's account very appreciably.

The Bolivian specimen, compared with this specimen of *dactylinus*, is much more olivaceous in coloration, lacks the reddish brown at the

³ Bull. Amer. Mus. Nat. Hist., XXXV, p. 208, 1916.

⁴ Nouv. Dict. H. N., X, p. 57, 1817.

base of the long hairs on the back, has much less ochraceous on the flanks and hind limbs, and differs particularly in skull characters in the greatly extended post palatal region. The enamel pattern of the molars is practically identical in *dactylinus* and *boliviensis*.

The palate of *D. typus* [= *D. dactylinus*] figured in the *Revue et Magasin de Zoologie* for 1852, plate 16 (text figure 4), shows that the postpalatal region in *dactylinus* (text figure 3) is much shorter than in *boliviensis* and the same as in the museum specimen from Villavicencio.⁵

Dactylomys dactylinus canescens, described by Thomas in the *Annals and Magazine of Natural History* for 1912, page 87, is of the *dactylinus* type with "rusty color of under fur strongly marked along the

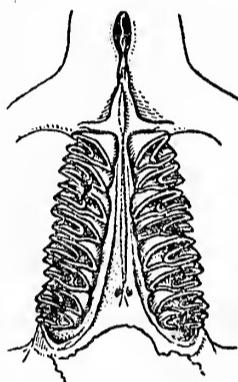


FIG. 3. PALATE OF DACTYLOMYS
DACTYLINUS, NO. 34594,
NATURAL SIZE

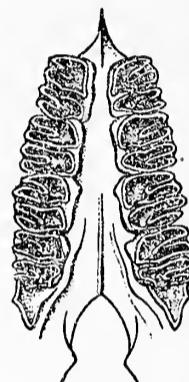


FIG. 4. PALATE OF DACTYLOMYS
TYPUS [=D. DACTYLINUS], COPIED
FROM REVUE ET MAG. DE ZOOL.,
1852, NATURAL SIZE

middle dorsal area." The skull of *boliviensis* is smaller than that of *d. canescens*, Thomas's measurement of upper tooth-series being 21.5 mm. as against a length of 17.7 in *boliviensis*.

The type is the only specimen of this species secured.

Chrotopterus colombianus sp. nov.

Type, No. 38966, Dept. of Mammalogy, sex indet., Rio Quatequia, near Bogota, Colombia; collector, Hermano Apolinario Maria. The type is a complete skin with skull, the pelage being in good condition but the bones of both forearms are broken and not measurable. The type locality is on one of the upper tributaries of the Rio Meta about fifty miles to the east of Bogota.

Characters.—Size about as in *auritus* but darker brown above, yellowish brown instead of gray below, and tragus quite broad and blunt.

⁵ The Villavicencio specimen has the posterior margin of the palate somewhat broken, so that the exact extent of the palate may be only approximated.

Color.—Above, everywhere uniform Mars brown of Ridgway, the hairs minutely tipped with whitish and with the extreme bases lighter, on the neck and behind the ears the white at the base of the hairs is much more extensive and produces a lightening in the external color; below the hairs are snuff brown except for an irregular median area of cream buff and an extensive area on the throat and chest which is cream buff; membranes naked, brownish black, with only a very slight whitening at the tip of the middle finger.

Ears.—Very large and broad, with numerous transverse, arcuate plications; tragus broad, with thickened anterior border and with single notch on anterior border and one tooth on posterior border, lacking the serrations seen in *auritus*.

Skull.—Similar in all details to that of *auritus*.

Measurements (from dried skin).—Total length, approximately, 115 mm.; tail vertebræ, 40; hind foot, with claws, 16.3; forearm, estimated from two fragments, 84; height of ear from base of tragus, 28.2; height of tragus, 8.5; greatest breadth of tragus, 4.3.

Skull.—Breadth of braincase, 10.6; least interorbital breadth, 4.2; zygomatic breadth, 13.2; breadth of palate across m³, 9.0; length of upper toothrow, c-m³, 9.4; length of mandible, 16.6; length of lower toothrow, c-m₃, 10.7.

Colombianus is readily distinguishable from *auritus* not only by the marked difference in color but by the much wider, thicker tragus, which lacks the serrated margins seen in Peters's figures⁶ and also noticeable in a specimen of *auritus* from Bonda, Colombia. The lack of white on the wing tips serves to separate it from *auritus guianæ*,⁷ while *auritus australis* described in the same paper as the foregoing species, evidently has the same color pattern as *auritus* since Thomas makes no mention of any color difference and bases the separation of the new subspecies upon the amount of white on the wing tip.

In the color pattern of the under parts, the throat and abdomen being lighter than the adjacent regions, is seen a possible approach toward the white throated species, *C. carrikeri*. *Carrikeri*, however, differs conspicuously from *colombianus* in color and also in details of ear structure, having a smaller ear and more slender tragus.

Histiotus inambarus sp. nov.

Type, No. 37194, Dept. of Mammalogy, ♀, Peru, Rio Inambari ($70^{\circ} 15' W.$, $13^{\circ} 55' S.$), altitude 2200 feet, March 12, 1915; collectors, Messrs. H. and C. Watkins. The type is a skin in fair condition with a slightly crushed skull.

General characters.—Similar in size and general characters to *Histiotus macrotus* but coloration paler, ears narrower and less convex along inner margin.

Color.—Above uniform Saccardo's umber, the hairs noticeably darker at the

⁶ Abhandl. k. preuss. Akad. Wissensch. Berlin, 1865, p. 305.

⁷ Ann. and Mag. Nat. Hist. (7), XVI, p. 308, 1905.

base, and with small postauricular patches of much lighter colored hair which are the same color as the underparts; below, everywhere light buff of Ridgway, the hairs darker at the base. Ears and membranes black.

Ears.—Very large and broad; connected by a very low ridge, scarcely discernable on the crown; inner margin well rounded at base but not conspicuously so; outer margin evenly convex from tip to base; tragus very tall, simple. Ears crossed by a number of transverse folds which appear as fine lines, seven visible on the upper and eight on the lower side.

Skull.—Normal for the genus.

Measurements.—(compared with those of *velatus*, in parentheses): Total length, 108 mm. (112); tail vertebrae, 52 (55); height of ear from base of tragus (dried skin), 26.7 (24.3, *macrotus*, 26.3); greatest breadth of ear, 17.7 (19.4, *macrotus*, 19.1); length of forearm, 48.3 (46.8, *macrotus*, 48.3).

Inambarus most closely resembles *macrotus* from which it may be readily distinguished, however, by its lighter color and differently shaped ear. The ear of *macrotus* has a wide and abrupt expansion at the base on the inner margin, in this respect only exceeded in the genus by *velatus*. The ear of *inambarus*, however, is more evenly rounded at the base of the inner margin and is somewhat narrower, especially at the base, than in *macrotus*. Also the ear of the new species is very black, contrasting with the yellowish color of the ear in the only adult specimen of *macrotus* available for comparison. As this specimen of *macrotus* is an alcoholic perhaps too much stress had best not be made on this point.

Inambarus differs even more apparently from *velatus* and *montanus* in coloration and ear characters than it does from *macrotus*.

GENERAL NOTES

RED BAT AND SPOTTED PORPOISE OFF THE CAROLINAS

Fragmentary observations at sea are frequently worth recording for want of more complete data. September 3, 1919, the writer was bound south on the coastwise steamer "Arapahoe." We rounded Diamond Light-ship, North Carolina, in the early afternoon. About an hour after sunrise, approaching the Capes of the Carolinas from the North, no land yet in view, a red bat (*Lasiurus borealis*) was observed darting about ship in erratic fashion, looking for cover. It settled between two booms at the break of the forecastle, but was promptly driven out. Later in the day a bat was seen once or twice about ship, probably the same individual. The preceding afternoon, standing to sea from New York, there had been calms and light airs, the weather more or less thick, with a dull grey sky. September 3 was clear, with a north-west breeze, rather light. This bat, doubtless a migrating individual, could then not have been driven off-shore by heavy weather. It was likely following its regular migration route southward, across the water.

In the afternoon, having passed well south of Diamond Light-ship, a number (perhaps 35) of spotted porpoises (*Prodelphinus plagiodon*) were observed. As many as ten or a dozen occurred together; jumping clear of the water, low; and also "rolling." Some came close along-side where one could see them swimming under the clear water, or lolling there, before they broke. They appeared very dark above with pale bellies. Nearby the purplish cast and the spotting were conspicuous. In one case one was accompanied by a smaller grey porpoise swimming close beside it, which looked like *Delphinus*.

—J. T. Nichols.

New York City.

THE COYOTE NOT AFRAID OF WATER

My theories regarding the aversion to water shown by the coyote were upset recently while on a trip to the Imperial Valley, in the desert region of southeastern California. A visit was made to Salton Sea, a large alkaline lake, and to some islands on the western shore, where numerous colonies of pelicans and cormorants are to be found each spring. The islands are really sand dunes which do not rise more than ten or fifteen feet above the surface of the sea. Each island is separated from its neighbor by a narrow channel of water which may be shallow enough to wade, or it may be eight or ten feet deep. On one island I was greatly astonished to find the fresh tracks of a coyote (*Canis ochropus estor* Merriam), so situated as to indicate that the animal had swum a channel about 30 feet wide and 8 feet deep. The tracks showed plainly where it had come down at one side of the channel, had entered the water, crossed to another island, made the circuit of that island, and then returned across the strip of water. Water from the shaggy coat had run down the legs into the footprints and there was evidence also that the animal had shaken itself. Upon following the tracks, I discovered that it had feasted upon two mudhens, the remains of which it had buried after the flesh had been picked clean from the bones. This particular island was separated from another one by a channel about 2 feet in depth and 22

feet in width. Here again the tracks showed unmistakably how the animal had entered the water and come out on the other side.

It therefore appears that narrow channels of water formed no barrier during the food-getting expeditions of this particular coyote, and it may be that much of the depredations on ducks' nests which have been attributed to raccoons because of their fondness for water may in reality be due to coyotes, who may not be so averse to swimming as some persons have believed.

—Harold C. Bryant.

THE FLORIDA SPOTTED SKUNK AS AN ACROBAT

April 13, 1919, while engaged in field work for the Biological Survey in Lee County, Florida, I established camp on a small prairie dotted with clumps of palmetto scrub close to an arm of the "Big Cypress" known as Kissimmee Billy Strand—being approximately 25 miles southeast of Immokalee. Shortly before sunset, as I was walking along a cow trail close to a palmetto thicket a Florida spotted skunk (*Spilogale ambarvalis*) suddenly appeared in the trail, not over 10 or 12 feet in front of me, standing *erect on his fore legs*, with his hind legs spread in a most threatening attitude. I did not see him assume this position, and he maintained it only for an instant, quickly resuming his normal position and disappearing in the brush, leaving only a slight odor behind. Apparently he, as well as I, had been taken by surprise, but just what his purpose was in striking this ludicrous attitude I am unable to say. My guide, Mr. J. M. Youmans, who has hunted extensively in this region, told me he has occasionally seen a similar performance by this skunk. A trap set in the scrub resulted in capturing the little acrobat next morning.

This species is essentially a prairie dweller and was found to be common over a large part of Lee County, probably reaching its southern limit not far from the locality mentioned above. On a previous trip I captured a specimen at Arcadia in the mouth of a pocket gopher's burrow after he had entirely devoured a trapped gopher (*Geomys tuza*). I learned also of the occurrence of the species at Palma Sola, on the Gulf coast of Manatee County. On the east coast, the species ranges south (rarely) to Lemon City and Cocoanut Grove.

—Arthur H. Howell.

THE FELIS OCELOT OF HAMILTON SMITH

In his important paper on the nomenclature of the small spotted cats of tropical America (Bull. Amer. Mus. Nat. Hist., vol. 41, pp. 341–419, Oct. 3, 1919), Dr. J. A. Allen has concluded after extensive discussion that if *Felis ocelot* H. Smith "is taken seriously it can only be construed as a synonym of *Felis pardalis* Linné." Should there be any doubt as to the correctness of this opinion, it may be noted that Smith's name is preoccupied by *Felis ocelot* Link, 1795 (Beytr. Zool., 2, p. 90), which is an undoubted synonym of *Felis pardalis* Linnæus.

Hamilton Smith described four varieties of his *Felis ocelot*, respectively numbered 1, 2, 3, and 4. Of these, No. 4 was identified with *Felis pardalis* Linnæus by Griffith in 1827 and has not been named subsequently; No. 1 was named *Felis chibigouazou* also by Griffith in 1827; No. 2 was called *Felis hamiltoni*, and no. 3

Felis griffithii, both by Fischer in 1830. Variety No. 2 was renamed *smithii* and No. 3 *canescens* by Swainson in 1838 (Anim. in Menag., pp. 120-121). Smith expressed the opinion, unsupported by any direct evidence, that Nos. 1 and 2 were South American and Nos. 3 and 4 Mexican. The names based on them have been allocated largely on the strength of this statement as to localities for the descriptions and figures offer little in the determination of forms known to be variable and at best only subspecifically separable. Thus Allen has regarded the two names based on Nos. 1 and 2 as South American and synonymous, recognizing *chibigouazou*, the earlier one, and placing *hamiltoni* as a synonym of it. In dealing with the Mexican ones, however, he has recognized two forms (*griffithii* and *pardalis*) representing Smith's Nos. 3 and 4. In this he was doubtless influenced by the grayish color ascribed to Smith's specimen of No. 3. In view of the great variability in the group, as fully noted by Allen, and in consideration of the nature of the case, which is not one of distinct species but of intergrading subspecies of which even actual specimens may be difficult to determine, it would seem desirable to place *griffithii* as a synonym of *pardalis* on much the same grounds that *hamiltoni* is placed under *chibigouazou*. By so doing, *albescens*, which is already well established for the form of northeastern Mexico and the south-central United States, would be retained.

Even the recognition of *chibigouazou* seems open to question, for at least two earlier names of possible pertinency are to be considered. These are *Felis maraqua* Link, 1795 (Beytr. Zool., 2, p. 91) and *Lynx brasiliensis* Oken, 1816 (Lehrb. Naturg., Zool., 3, p. 1050). The first is described as follows: "F. maraqua, cauda elongata, corpore luteo, dorso nigro striato, lateribus nigro-maculatis." The word *maraqua*, used by Link as a specific name, seems to be a variant of one of the Brazilian names for cats of the *pardalis* group; therefore, it carries the implication that the description was derived from some previous account of one of these animals. However, the source of the name is not indicated otherwise and the description itself is so brief and so generalized that it might apply to any of several species. Like many other names, it is not wholly unidentifiable, for at least it refers to a South American spotted cat. It may therefore, be synonymized with any definitely identifiable earlier name for such a cat, as for example, *Felis tigrina* Schreber, 1777. To attempt to establish it in use would only be justified in case it was the earliest name applied to any cat having the characters mentioned.

Turning to Oken's name *Lynx brasiliensis*, we find a description of considerable detail with measurements and association with the native name *mbaracaya*. Although the source of this native name is not cited by Oken, the large use which he has made of Azara's work on the quadrupeds of Paraguay in other cases makes it probable that the name was obtained from that work. The probability is greatly strengthened by comparison of Oken's description and Azara's text which show numerous points of similarity. There is nothing in Oken's description which cannot be found in Azara except the measurement of total length, given as 22 inches, an obvious error, probably a misprint for 42 inches, the dimension given by Azara. The tail length of 13 inches is given by both authors. The evidence is thus convincing that Oken's *brasiliensis* was based on Azara, who states definitely (Quad. Paraguay, 1, p. 152, 1801) that the *mbaracaya* is the same as the *chibigouazou*. Hence the technical name *chibigouazou* should be supplanted by *brasiliensis*.

From the foregoing, therefore, it is concluded (1) that *Felis ocelot* Smith is preoccupied and wholly untenable, (2) that *Felis griffithii* Fischer is a synonym of *Felis pardalis* Linnaeus, (3) that *Felis maraqua* Link is not fully identifiable and may be disposed as a possible synonym of *Felis tigrina* Schreber, and (4) that *Felis chibigouazou* Griffith is a synonym of *Lynx brasiliensis* Oken which becomes *Felis (Leopardus) pardalis brasiliensis*, the first tenable name for a South American cat of the *pardalis* group. Thus not only the troublesome *Felis ocelot* goes out of use, but also all the names based on the so-called varieties associated with it by Hamilton Smith.

—Wilfred H. Osgood.

NOTE ON GUELDENSTAEDT'S NAMES OF CERTAIN SPECIES OF FELIDÆ

Recent investigations of the African Felidæ have led me to the consideration of the nomenclature of the *caracal* group, and especially to the alleged "*Felis caracal* Gueldenstaedt."¹ Although Gueldenstaedt's names were given correct binomial form by nearly all subsequent authors they are not binomial in Gueldenstaedt's text. The first author known to me to have challenged their acceptance is Matschie, in a paper on the caracals published in 1912,² in which he states that Gueldenstaedt's names cannot be accepted because they are none of them binomial. To demonstrate the correctness of Matschie's claim it is only necessary to quote Gueldenstaedt's diagnoses, which run as follows:

"*Lynx*: *Felis auriculis apice barbatis; capite et corpore albido-ruffo, nigro maculato; cauda obsolete annulata, apice nigra*;

"*Felis ruffa*: *Felis auriculis apice barbatis; capite ruffo, fronte et temporibus nigro striatus; corpore ruffo, fusco maculato; cauda subtus et apice alba, supra nigro fasciata*;

"*Caracal*: *Felis auriculis apice barbatis, extus nigris; capite, corpore et cauda unicoloribus fuscentibrunneis*;

"*Chaus*: *Felis auriculis apice nigro barbatis, extus brunneis; capite, corpore et caudæ basi unicoloribus, fuscenti-luteis; cauda apicem versus albido et nigro annulata, ipso apice nigro*."

The second of these species, "*Felis ruffa*," has the appearance of being binomially named, but a reference to the preceding context on the same page (page 499, second paragraph³) is sufficient to show that this is, as well as "*Lynx*," "*Caracal*," and "*Chaus*," a vernacular name, not a technical one, it being simply the rufous cat; in other words, the "Bay cat" of Pennant translated into Latin, the language in which Gueldenstaedt's paper is written.⁴ In other parts of his

¹ *Chaus, animal deli affine descriptum. Auctore A. I. Gueldenstaedt. Novi Comm. Acad. sci. imp. Petropolitanæ, XX (for 1775), 1776, pp. 483–500, pls. xiv, xv, animal and skull of the Chaus. Diagnoses of four species, pp. 499–500.*

² Über einige Rassen des Steppenluchses *Felis (Caracal) caracal* (St. Müller). Von Paul Matschie. Sitzungsb. Ges. naturf. Freunde Berlin, 1912, pp. 55–67. Comment on Gueldenstaedt's names, pp. 56–57.

³ "A Fele ruffa facile distinguitur," etc.

⁴ "Addidit nuper Zoologus his acutissimus (vid. sp. 136. in Synops. of Quadrup.) animal americanum Lynci proximum, quod illi *Felis ruffa* (bay cat) dicitur. Addamus nunc alterum animal asiaticum Caracali adeo cognatum, ac *Felis ruffa* Lynci, quod à nobis *Chaus* appellator." (Op. cit., p. 484.)

memoir *Felis ruffa* is also unmistakably used as a vernacular name in the same way as *lynx*, *caracal*, and *chaus*. In the summary of this paper (op. cit., p. 62) these cats are enumerated as "Lyncis Auctorum, *Felis ruffæ Pennanti*, *Caracalis Buffonii et Chai nostri*." Gueldenstaedt's *Lynx* is the *Felis lynx* Linné; his *Felis ruffa* is the Bay Cat of Pennant, the "*Felis rufa* Gueldenstaedt" as rendered by Schreber; his *Caracal* is primarily the Caracal of Buffon; his *Chaus* is the "*Felis chaus* Gueldenstaedt," as rendered by Schreber. Schreber, in Theil III of his *Säugthiere*, in the part issued in 1777, is the first author to mis-quote Gueldenstaedt's vernacular names, thus giving them the form and status of properly constructed binomial technical names, and they have been accepted as such by subsequent authors who have apparently, almost without exception, taken them from Schreber without verification. It thus happens that the North American bay *lynx* still carries in our latest publications the technical designation *Lynx ruffus* (Gueldenstaedt), although the correct authority for the name is Schreber, who first gave it form, changing the specific name *ruffa* to *rufa*. The name of the bay *lynx* should therefore be *Lynx rufa* Schreber.

As of bibliographic interest, it may be mentioned that Gueldenstaedt's paper is not cited by Erxleben in his "Systema Regni Animalis," published early in 1777.

—J. A. Allen.

THE WOOD RAT AS A COLLECTOR

It is of course well known that wood rats of the genus *Neotoma* carry away and put in their nest piles almost any trinket or small article which they find. Doctor Mearns records the fact that the white-throated wood rats of southern Arizona (*Neotoma albicula*) gather together sticks, stones, cow-dung, bones, bits of glass, plants, seed-pods, and similar materials, and on one occasion, when he was spending the night of April 19-20, 1888, in a cabin in Bloody Basin, Arizona, they carried off some boxes of pills. Hen's eggs, powder boxes, candles, cakes of soap, potatoes, Indian corn, seeds of various wild plants, juniper berries, and joints of cactus were some of the materials found in their stores. (Mammals of the Mexican Boundary, Bull. 56, U. S. Nat. Mus., 1907, pp. 477-480.)

Through the courtesy of Miss Crissie Cameron of Tacoma, Washington, a member of the Committee on Biological Survey Coöperation of the Mountaineers Club, we have been favored with the following notes on the collecting activities of an individual western bushy-tailed wood rat (*Neotoma cinerea occidentalis*). This animal had its nest in a box on some rafters in the girls' dormitory of the Mountaineers' lodge near Snoqualmie Pass, in the Cascade Mountains in Washington. A bushel of articles had been gathered by the industrious rats. "The nest was made of oakum pulled from the chinks in the cabin and lined with what appeared to be wool or cotton pulled from a comforter. The nest measured 6 inches in diameter on the inside and 8 inches on the outside."

The nest and box contained the following articles:

rags, chewed up	apple core
leaves and grass, considerable quantity	onion peel
paper, chewed up	bacon rind
thumb of glove	raisins
string, pieces	chocolate, 10 bars
thongs	figs

oakum	scone
puff balls	candles, 19 pieces
coin, one dime	potatoes, 4
newspaper clipping on prevention of forest fires	dried apricots
coffee can cover 4 inches in diameter	soap, several cakes
paraffin from jelly glass	lemons
bread crusts	mushrooms
bones	beans
meat scraps	peanuts
cantaloupe rind	banana
	sugar, 15 lumps

Miss Cameron writes that the box containing the nest was removed, and a home-made box trap put in its place, but that the wood rat avoided the spring, and industriously set about collecting a quantity of materials for another home.

—Walter P. Taylor.

A NOVEL NESTING PLACE OF THE RED-BACKED MOUSE

On September 7, 1919, in Sunset Park, Mount Rainier, Washington, I stowed a dunnage bag containing clothes and miscellaneous articles beneath a thick conifer to keep off the wet. Two days later I had occasion to get into it. Reaching inside, I felt something clinging to my hand, and looking down, I was surprised to see a mother red-backed mouse (*Eotomys gapperi saturatus*) with one young one clinging to one of her teats, and another but just let loose. On investigating further two more young were found. The mother had evidently regarded my dunnage bag as an exceptionally dry log with a wonderfully cosy interior, and had given birth to her four young there. It is of interest that we found red-backed mice breeding in Mount Rainier National Park from early in July until the middle of September.

—Walter P. Taylor.

THE RANGE OF THE HOARY MARMOT IN MONTANA

The Montana hoary marmot (*Marmota caligata nivaria*), according to Howell, occurs in two comparatively small areas, one in northwestern Montana, covering approximately what is now the Glacier National Park, and the other in Idaho, in portions of the Bitterroot and Salmon River Mountains (North American Fauna, No. 37. Revision of the American Marmots, pp. 66 and 67). I find that I have a few observations, made in Montana several years ago, that increase this range somewhat. While I paid no great attention to mammals at that time, and did not collect specimens, such an animal as the hoary marmot is so conspicuous, so easily observed and so unmistakable that there can hardly be doubt as to the species, though the subspecies, of course, might be in question.

On September 8, 1909, while crossing the continental divide at a point in Deer Lodge County, Montana, I observed two of these animals, and heard their shrill whistled call. I was in the company of Mr. J. S. Baird of the Forest Service at the time. Neither of us had ever seen such an animal before, or heard of one. When we described it to rangers of the Deerlodge National Forest, none of them knew it, which leads me to believe that it cannot be common in that part of the

state. The point where the animals were seen was at the head of Ten-mile Creek, a tributary of the Big Hole River, just south of the continental divide, which in this part of the state runs east and west. This locality is probably an eastward extension of the Idaho area of the range of this species, for almost continuous high mountains extend from this point west to the Bitterroot Mountains.

Nearly two years later, in the summer of 1911, I again saw this animal, and in this and the next summer became fairly familiar with it. The locality this time was in the mountains of Teton County, Montana, just south of the Glacier National Park. Here in the headwaters of Birch Creek, and the Teton and Sun Rivers the marmot was found in small numbers, though by no means as commonly as in the Glacier Park. The southernmost point at which I observed it here was at the head of Indian Creek, a tributary of the West Fork of the Sun River, in northern Lewis and Clark County. Some of the forest rangers in this vicinity reported them on the head of the Dearborn River, which is still somewhat farther south. This area is obviously an extension southward of the more northern area of the range of this species, though the two areas are separated by a gap of a few miles just south of the Glacier Park, where there are no high mountains.

It is not probable that the southern and northern areas of the range of this species are connected along the continental divide, for the mountains between the head of the Dearborn River, and those of Deer Lodge County are mostly low in elevation, with only a few small areas that extend above the Canadian zone.

—Aretas A. Saunders.

RODENT MOUNTAINEERS

In the course of investigations by the Biological Survey party on Mount Rainier during the summer season of 1919 several rumors were heard of mammals observed on the summit of the mountain. These were uniformly questioned by us until finally a white-footed mouse (*Peromyscus maniculatus oreas*) was actually secured. It was forwarded to the Honorable Roger W. Toll, superintendent of Mount Rainier National Park, who skinned and saved the specimen. An affidavit accompanying the skin certifies to the fact that the mouse was found and killed August 8, 1919, at Register Rock, one of the high points on the mountain, 14,100 to 14,200 feet altitude. The affidavit is signed by two guides and four climbers, all members of the summit party.

At a later date Mr. and Mrs. William L. Finley of Portland, Oregon, made the ascent of Mount Rainier and saw a little chipmunk (*Eutamias amoenus* subsp.) on the summit.

On August 6 a climbing party of the Mountaineers and the writer observed a Douglas squirrel (*Sciurus douglasii*) playing about in the rocks apparently very much at home no less than 2500 feet above timberline at Camp Curtis on the north side of the mountain. Later in the day one squirrel was seen and another heard at the summit of Steamboat Prow, 9700 feet high; and on the following day, in company with a party of the Mountaineers, en route to the summit of Mount Rainier via Emmons Glacier, the writer saw a Douglas squirrel at an altitude of approximately 10,500 feet. This squirrel was on the snowy surface

of the glacier, far from any rocks or earth. He was tripping downhill as if he had just been to the summit and was enjoying the experience hugely.

At Camp Muir, 10,000 feet, on September 26, the writer caught white-footed mice (*Peromyscus maniculatus oreas*), western bushy-tailed wood rats (*Neotoma cinerea occidentalis*) and the large-footed meadow mouse (*Microtus richardsoni arvicoloides*).

The occurrence of the large-footed meadow mouse at Camp Muir is perhaps the most striking record of all. Ordinarily dwelling in moist alpine parks and meadows at an average altitude of 5500 feet, this animal has here climbed to a height of 10,000 feet, or approximately 3500 feet above the tree line. Instead of pleasant meadow country with an abundance of water and herbaceous vegetation, the mouse here encounters rocks, furious winds, snow and ice, and has only lichens and a very few hardy plants on which to feed. The mouse was captured under the wall of a stone cabin. That he was hard pressed for food may be indicated by the fact that his stomach contained a piece of an old woolen sock.

The altitudes attained by the mammals on Mount Rainier are not so remarkable in themselves, for it is well known that several mammals attain the summit of Mount Whitney, California, 14,504 feet, the highest point in the United States south of Alaska. The chief interest is in the fact that while timberline on Mount Whitney averages perhaps 11,500 or 12,000 feet in altitude, the trees on Mount Rainier stop at an average altitude of 6500 feet. Thus the mammals seen on the summit of Rainier had climbed between 7000 and 8000 feet above timberline.

—Walter P. Taylor.

DOES THE CUTEREBCRA EVER EMASCULATE ITS HOST?

In the early 50's, Dr. Asa Fitch, State Entomologist of New York, was frequently informed by the hunters in the vicinity of Lakeville, New York, that at least one-half of the male squirrels of all the species found in the country were castrated. Some thought that jealous rivals of the same species did it, and some blamed the redsquirrels for all this maiming.

In August 13, 1856, Doctor Fitch had sent him a chipmunk in whose scrotum was a bot-fly grub. He says (N. Y. State Entom. 3rd Ann. Rept., 1857, Supp., p. 479): "I find the fleshy glandular tissue of the testicles wholly consumed, nothing of them remaining but their empty outer skin. . . . There are some hunters, however, that say they have found two grubs in the scrotum of some Squirrels, and they conjecture that it is by these that the testicles are destroyed." . . . "From what has now been stated I think that everyone will agree with me in the opinion, that it is by this fly that the Squirrels in our country are emasculated" (p. 482).

In 1889 Dr. C. Hart Merriam contributed to "Insect Life," vol. 1, p. 215 (U. S. Dep. Agr.) a paper containing the following facts: He had frequently found the *cuterebra* in or near the scrotum of the graysquirrel, the redsquirrel, and chipmunk. On the 7th and 8th of October, 1885, he killed more than 50 chipmunks at the south end of Lake Champlain and found fully one-half infected with *cuterebra*. More females than males were thus afflicted. The "warbles" were anywhere from the umbilical region to the genitals; in a few cases they were in the axilla, and in one or two in the upper part of the foreleg; a number had 2, some had 3 of the bots.

Doctor Fitch, and most of those who have followed after him, have assured us that the bot emasculates the host. *Does it?* The evidence is far from convincing.

1. We have proof that a bot develops under the skin of all of our squirrels; that it often appears in the scrotum of the male; but is as often found in other parts of the body, and in the female as much as in the male.

2. No trace of the testes is discernible after the development of the grub. Why should there be? For at the season of all observations—August, September, and October—the testes are normally reduced to almost nothing and are even, as Bachman says (Vol. 1, p. 269), “drawn into the pelvis.”

3. There is no proof that the bot eats fibrous tissue, or anything but juices.

4. It is contrary to the known ways of evolution; that any species should develop a habit that would tend to cut off its own food supply.

5. The final proof has never yet been offered, namely—a male, apparently emasculated by the grub, kept over till next rutting season for observation. I strongly suspect that such males would surprise us by appearing on time, fully equipped, with two perfectly good, functioning testicles, that had been safely tucked away in their original nest inside the pelvis; evidencing that the only harm the bot-fly warble did, was the temporary drain while the host was carrying it. No one yet has reported one of these squirrels taken in the rutting season of its species, and obviously castrated.

A friend of mine, who had the ill-luck to develop a bot-warble in the calf of his leg, tells me that at times, when the creature was turning over, or in some way moving, the irritation was maddening.

The following species are known to be infected by the bot-fly or warble: gray-squirrel, foxsquirrel, redsquirrel, Eastern chipmunk, striped groundsquirrel, Richardson groundsquirrel, Franklin groundsquirrel, least vole, housemouse, jack-rabbit, etc.

Perhaps some reader has made observations that will decide this question.

—Ernest Thompson Seton.

THE FLYING SQUIRREL AS A BIRD KILLER

On April 6, 1914, an adult female flying squirrel (*Glaucomys volans*) was captured with her two young and placed in a roomy cage in the workshop with a section of tree trunk containing a flicker's hole as a nest. Two or three days later a fine male yellow-bellied sapsucker was captured unhurt, and placed in the same cage where he made himself at home on the stump. I was greatly surprised the next morning to find his bones on the bottom of the cage, picked clean. This strong, hardy woodpecker in perfect health had been killed and eaten during the few hours of darkness, by the old mother flying squirrel, though she had other food in abundance. While pondering the tragedy visions of the many holes in the woods that had been found containing feathers and other remains of small birds came to mind, and I wondered if the beautiful and apparently inoffensive flying squirrels were responsible.

Small birds frequently take refuge in old woodpecker holes and natural cavities, where they are at the mercy of such a nocturnal wanderer. I am aware that flying squirrels have been accused of eating birds' eggs and young birds,

and while I have no positive proof that they prey on adult birds in a wild state, I have my suspicions; perhaps others have more conclusive evidence.

My friend, Mr. L. L. Pray, tells me that four flying squirrels in his possession ate prodigious quantities of "pinch bugs," and other beetles, as much as a pint a meal. The wings and legs were cut off, and the bodies eaten. They also displayed a fondness for raw meat, as do the equally mild appearing white footed mice.

—H. L. Stoddard.

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THE TECHNICAL NAMES OF TWO COLOBUS MONKEYS

Pennant, in his 'History of Quadrupeds' published in 1781, described two species of four-fingered African monkeys, based on specimens in the Leverian Museum, "brought over by Mr. Smeathman" from "Sierre Leone." The first of these he described and figured (l. c., p. 197, no. 110, pl. xxiv), as the "Full-bottom Monkey," in allusion to the "long, coarse, flowing hairs" of the head and shoulders, "like a full-bottomed periwig." His plate was poorly copied by Schreber, and published as Plate XD, legended as "*Simia Polycomos* Zimmerm." but, as shown below, the plate could not have been issued till after the year 1780,¹ when Zimmermann in his 'Geographische Geschichte des Menschen und der vierfussigen Thiere' (II, 1780, p. 202, no. 105) described his "Der vierfingerige Peruquen-Affe," which he named "*Cebus Polykomos*," based exclusively on the "Full-bottom Monkey" of Pennant,² evidently from manuscript notes sent to him by Pennant before the publication of the 'History of Quadrupeds.'³ The publication of Zimmermann's name and description of the species thus antedates Pennant's by one year.⁴ This is the earliest technical designation for this species, usually cited as "*Simia polycomos* Schreber, 1775," the current modern equivalent being "*Colobus polycomus* (Schreber)."

The second of Pennant's two species of monkey here under consideration is his "Bay Monkey" (l. c., p. 198, no. 111), which he says likewise came from Sierra Leone and was based on Mr. Smeatham's specimens in the Leverian

¹ Sherborn (Proc. Zool. Soc. London, 1891, p. 590) gives the date of publication as probably about 1800.

² Zimmermann, in the third volume of his 'Geographische Geschichte' (1783, p. 170), in his list of African mammals, gave it as "Der vierfingerige afrikanische Affe, *Cercopith. Polykomos*."

³ Zimmermann thus acknowledges (l. c., p. 202) Pennant's favor: "Herr Pennant hat diese neue Affenart, die er in den vortrefflichen Kabinette des Herrn Leevers (das reichste an Quadrupeden und Vögeln in Europe) fand, zuerst beschrieben." His citation of Pennant's work is "Full-bottom Monkey. Pennant History of Quadrupeds," without a reference to the page, which he always gives in citing Pennant's earlier 'Synopsis of Quadrupeds.'

⁴ Attention was first called in 1902 to the tenability of Zimmermann's name in my paper on "Zimmermann's 'Zoologiæ Geographicæ' and 'Geographische Geschichte' considered in their relation to Mammalian Nomenclature" (Bull. Amer. Mus. Nat. Hist., xvi, 1902, p. 22).

Museum. He did not, however, give a figure of it. This species was technically named by Kerr in 1792 (*Anim. Kingd.*, p. 74, no. 62) *Simia* (*Cercopithecus*) *badius*. Eight years later it was renamed by Shaw (*Gen. Zool.*, i, pt. 1, 1800, p. 59) *Simia ferruginea*, this name being exclusively based on the "Bay Monkey" of Pennant. In 1812 E. Geoffroy (*Ann. Mus. d'Hist. nat. Paris*, xix, p. 92), emended Shaw's specific designation to *Colobus ferruginosus*, citing Shaw's *Simia ferruginea* as a synonym.⁵

Pennant's "Full-bottom Monkey" and his "Bay Monkey" were thus the base of the first two species of *Colobus* to receive formal technical designations, and were described from specimens from a known geographic source. Furthermore they were the only species originally referred by Illiger to his genus *Colobus* as, respectively, *Simia polycomus* Schreber and *Simia ferruginea* Shaw. The former became (by subsequent designation) the genotype of *Colobus*. The latter (*Simia badius*) is here designated the genotype of Rochebrune's genus *Piliocolobus* (1866), as I fail to find a previous designation of a genotype for this genus.

—J. A. Allen.

RECENT LITERATURE

Grinnell, Joseph, and others. CALIFORNIA GROUND SQUIRRELS. A BULLETIN DEALING WITH LIFE HISTORIES, HABITS AND CONTROL OF THE GROUND SQUIRRELS IN CALIFORNIA. Monthly Bull. California State Comm. Horticulture, vol. 7, nos. 11 and 12, November-December, 1918, pp. 595-807, or separate pp. 1-203. January 27, 1919.

This bulletin was put forth to serve as a "manual for the use of county horticultural commissioners and systematic workers," and constitutes "a veritable textbook, through the aid of which it is now possible for the agricultural teacher throughout the public schools to place the subject clearly and concisely before the young patriots who are aiding so largely in the work of extermination."

Its scope will be indicated by the list of articles included: Natural history of the ground squirrels of California, by J. Grinnell and J. Dixon; The Columbian Ground Squirrel, by W. T. Shaw; A history of ground squirrel control in California, by W. C. Jacobsen; A study of fumigation methods for killing ground squirrels, by John S. Burd and G. R. Stewart; The Rodent Control Division, by S. V. Christierson and C. A. Wilkins; and Rodent Eradication work of the Biological Survey in California, by F. E. Garlough. Formulas for destroying rodents are given in the appendix.

The ground squirrels dealt with by Grinnell and Dixon include eighteen forms occurring in California belonging to three genera as follows: *Citellus*, twelve species or subspecies; *Callospermophilus*, three; *Ammospermophilus*, three. Shaw's paper pertains to the chief rodent pest occurring in eastern Washington and portions of neighboring states, the Columbian ground squirrel (*Citellus colum-*

⁵ In 1895, in a paper on the names of mammals given by Kerr (*Bull. Amer. Mus. Nat. Hist.*, vii, pp. 179-192), I called attention (l. c., p. 186) to the availability of Kerr's name *badius* over Shaw's *Simia ferruginea*.

bianus). The more strictly economic contributions concern principally *Citellus oregonus* and *Citellus beecheyi* and its subspecies.

Regarding the relation of the study of the life-histories of the Californian ground squirrels to the practical problem of their control the authors (Grinnell and Dixon) state (p. 5): "It would seem that knowledge, as full as possible, of the ground squirrels of California is necessary to determining the most successful means of controlling them and to applying these means properly to the varying conditions throughout our state. This knowledge should include the main distinctions by which each may be known from its relatives, the distribution of each of the species, the extent of the burrows, the breeding rate, the food habits, and, indeed, every other class of facts obtainable relative to their natural history." Going on from this they enunciate a principle of much importance, and one which, all too often, is overlooked by the ultra practical. "It is not often apparent, in advance, which facts will and which will not prove of critical importance in economic work."

After presenting a "Key to the Ground Squirrels of California" based on those external differences which can be most readily appreciated, accounts of the species are presented. The technical matter of less general interest is presented in smaller type with headings as follows: Other names (in addition to the approved vernacular and Latin names recognized by the authors); field characters; description; color variations; measurements; weights; type locality; distribution area; specimens examined. Then follows a full account in larger type of the distribution and habits of the form.

The style is nontechnical and very readable. Perhaps the detailed presentation will discourage a few readers, but any disadvantage here is more than made up by the relative completeness of the information recorded. Possibly the accounts of habits would have been made more accessible and convenient for reference purposes by a series of side heads like those utilized in presenting the technical matter.

The paper is generously illustrated with paintings by Fuertes, photographs, mostly by Dixon, maps, line drawings, and diagrams. It is unfortunate that the paper used is of too poor a quality to do real justice to the half-tones. In spite of this the care put into the illustrations makes the paper unusually attractive. When State and Government authorities realize that severely plain literary style, cheap illustrations and a poor quality of paper are no guarantee of merit or even of true economy, and that real attractiveness is an important element of each paper, it is likely that there will be a more active demand for State and Government publications on the part of the public than is the case at present.

A number of drawings to scale of the burrow systems of the different squirrels are of interest.

No novelties in systematic status appear. The geographic range of *Citellus beecheyi beecheyi*, formerly believed to embrace the Upper Sonoran, Lower Sonoran and Transition zones of west-central California throughout the coast region as far south as Ventura County, is now extended southward to include the coastal portions of the State to the Mexican line, the range of *C. b. fisheri* being correspondingly restricted.

That systematic work may possess at times considerable importance from the standpoint of economic problems is indicated by certain facts concerning the

Douglas ground squirrel. Apparently differences in color separating this squirrel from others in California are associated with differences in habitat and food preference as well (p. 53). It is unfortunate that there are those who question the value of systematic work, description, and classification. As the eminent English mammalogist Hinton says, ". . . so many have yet to learn that all branches of science are valuable and interdependent, that in reality there are not two kinds of science—one called 'applied,' essential, it extracts gold; the other called 'pure,' quite unimportant it extracts nothing but facts." (M. A. C. Hinton, *Rats and mice as enemies of mankind*, British Museum of Natural History, London, 1918, pp. 26-27.)

Further on in the account of the Douglas squirrel the principle is enunciated that "the squirrels require a certain amount of space around them so that they can have a fair show of reaching the safety of their burrows after an enemy is first caught sight of" (p. 54). This principle is apparently of general application among the Sciuridae.

While in the past, hibernation of animals as a result of the effect of cold and snow has been emphasized, estivation due to a lack of moisture has hardly received its share of attention. Recent investigations have demonstrated its importance. Thus Grinnell and Dixon show that the Oregon ground squirrel of the warm Upper Sonoran and Transition zones of northern California disappears from view during July and does not reappear until the following March (pp. 66-67). On the other hand the Belding ground squirrel (*Citellus beldingi*) of the cold Hudsonian Zone of the high Sierra Nevada does not become quiescent until a full two months later than the Oregon ground squirrel (p. 72).

The immensity of losses to agriculture caused by squirrel pests is seldom fully appreciated. The authors' studies of *Citellus oregonus* lead them to conclude that 30 grams of forage are eaten daily by each individual. In thickly settled squirrel country the average number of the animals per square mile is estimated at 70,000. This number will consume 2,100,000 grams, or more than 2 tons of green forage per square mile every day. "Granted that a grazing steer eats 50 pounds of pasture forage each day, we conclude that the squirrels on a square mile of pasture appropriate each day the forage which might support ninety head of cattle" (p. 63).

W. T. Shaw's paper on the Columbian ground squirrel (pp. 118-128) is worthy of more than casual attention. This contribution, based on years of work by the author, is all too short, and impels the reader to look with keen anticipation to the publication of the full report of Professor Shaw's illuminating investigations. These ground squirrel papers of Grinnell and Dixon and of Shaw are of a type of zoölogical investigation which has been all too rare in mammalogy, particularly in this country.

Much credit is due to the State leaders of rodent control in California for the enlightened manner in which they are dealing with their problems. If those in charge of practical projects of rodent control and animal administration generally made as vigorous efforts to stimulate scientific research of a basic character and then to utilize the results thereof, there is no doubt whatever that greater progress would be achieved than is now the case.

—Walter P. Taylor.

Jordan, David Starr, and James Zaccheus Gilbert. FOSSIL FISHES OF SOUTHERN CALIFORNIA. II. FOSSIL FISHES OF THE MIocene (MONTEREY) FORMATIONS. Leland Stanford Junior Univ. Public., Univ. Series, pp. 13-60, 1919. Delphinidæ, p. 60.

At the end of the second paper of this group, pp. 59 and 60, is an account, rather more than a page, descriptive of three slabs of stone which either contain impressions (matrices) of cetacean vertebræ, or the fossils themselves. They are all somewhat dubiously referred to *Delphinus occiduus* of Leidy which is in the same manner transferred to *Phocaena*. It seems unfortunate that such slight and uncertain evidence should result in a generic change for Leidy's type, which is undoubtedly not congeneric with either of the names that have been used. The specimens are from San Pedro and Lompoc, Los Angeles and Santa Barbara Counties, in diatomaceous shales and of uncertain Miocene age. The essential synonymy of *Delphinus occiduus* Leidy, the type of which is in the Museum of Comparative Zoölogy, Harvard University, is as follows:

Delphinus occiduus LEIDY, Proc. Acad. Nat. Sci. Phila. 1868, 197 (type locality Half-moon Bay, Calif.); Jour. Acad. Nat. Sci. Phila. 1869, 431; COPE, Am. Nat., 1890, 616; TROUESSART, Cat. Mam., 1898, 1031; HAY, Bull. U. S. Geol. Survey, 179, Fossil Vert. N. Am., 1901, 594; EASTMAN, Bull. Mus. Comp. Zool., 1907, 93-94, plate 4, fig. 1 (type).

Phocaena occiduus, JORDAN AND GILBERT, Leland Stanford Junior Univ. Public., Univ. Series, Fossil Fishes of Southern California, 1919, II, pp. 59, 60, plate IX, fig. 2; plate XXVIII, figs. 1, 3.

—William Palmer.

ALLEN, A. A. A Christmas walk with birds and beasts. Amer. Forestry, vol. 25, pp. 1526-1530, 12 figs., December, 1919. (Popular account of tracks of common eastern mammals.)

ALLEN, J. A. Severtzow's classification of the Felidæ. Bull. Amer. Mus. Nat. Hist., vol. 41, pp. 335-340. September 22, 1919. (Discussion of status and type-species of the 27 subgeneric names applied to cats by Severtzow, 1857-1858; and comparison with Pocock's "Classification of Existing Felidæ," 1917.)

ALLEN, J. A. Notes on the synonymy and nomenclature of the smaller spotted cats of tropical America. Bull. Amer. Mus. Nat. Hist., vol. 41, pp. 341-419; figs. 1-31. October 3, 1919. (The following genera are recognized for Neotropical cats, excepting jaguars and pumas: *Leopardus* Gray, type *pardalis*; *Margay* Gray, type *wiedii*; *Oncilla*, new, type *oncilla*; *Noctifelis* Severtzow, type *guigna*; *Oncifelis* Severtzow, type *geoffroyi*; *Lynchailurus* Severtzow, type *pajeros*; *Herpailurus* Severtzow, type *yaguarondi*. These include 37 forms.)

ANDERSON, RUDOLPH MARTIN. Addition to list of mammals of Jasper Park, Alberta. Canadian Alpine Journ., vol. 10, p. 69. 1919. (*Mustela rixosa* taken on Miette River, July 11, 1898.)

BEEBE, WILLIAM. Higher vertebrates of British Guiana. With special reference to the fauna of Bartica District. Zoologica, vol. 2, no. 7, pp. 205-227, May, 1919. (Contains a preliminary checklist of mammals, including 119 forms.)

- CABRERA, ANGEL. Genera mammalium. Monotremata, Marsupialia. Museo Nacional de Ciencias Naturales, Madrid. Pp. 1-180; 19 plates. June 23, 1919. (Keys to the families and genera, and lists of the species and subspecies of monotremes and marsupials, with geographical distribution. New generic names are *Minuania*, type *Didelphis dimidiana* Wagner; *Holothylax*, type *Didelphis opossum* Linné; and *Amperta*, type *Chætocercus cristicauda* Krefft.)
- CADWALADER, WILLIAMS B. Report of the board of directors. Forty-seventh Ann. Rep. Zool. Soc. Philadelphia, pp. 1-18. 1919. (Mammals exhibited in the Philadelphia gardens for the first time include the Sumatra tiger, Texas fox squirrel, Sumatra elephant, and Kashmir deer.)
- CLARKE, JOHN M. An elephant with four tusks. Science, n. s., vol. 50, pp. 395-396, 1 fig. October 24, 1919.
- DE ONG, E. RALPH. Parasites which affect the food value of rabbits. California Fish and Game, vol. 5, no. 3, pp. 142, 143. July, 1919. (Relates particularly to wild rabbits of California.)
- DIXON, JOSEPH. Notes on the natural history of the bushy-tailed wood rats of California. Univ. California Pub. Zool., vol. 21, pp. 49-74, plates 1-3. December 10, 1919. (General account of *Neotoma cinera cinera* and *N. c. occidentalis*. The supposedly extinct species, *Teonoma spelaea* Sinclair, is considered inseparable from *N. c. occidentalis*.)
- EVERMANN, BARTON WARREN. The northern fur-seal problem as a type of many problems in marine zoology. Sci. Monthly, vol. 9 (Sept.), pp. 263-282, 10 figs. August 30, 1919. (Brief history of the Pribilof seal herds, from the discovery of the islands in 1786 down to the present time.)
- FERRIS, G. F. Anoplura of the Canadian arctic expedition, 1913-1918. Rep. Canadian Arctic Exped. 1913-1918, vol. 3, part D, p. 11d. September 12, 1919. (Report on lice collected by Frits Johansen and A. Castel on arctic mammals.)
- GRINNELL, JOSEPH. Four new kangaroo rats from west-central California. Proc. Biol. Soc. Washington, vol. 32, pp. 203-205. December 31, 1919. (The genera *Perodipus* and *Dipodomys* are combined, and new forms are described as follows: *Dipodomys jolonensis* and *D. sanctiluciae* from Jolon, Monterey County; *D. berkeleyensis* from Berkeley; and *D. californicus eximus* from Sutter County.)
- GRINNELL, JOSEPH. See also Hall, Harvey Monroe, and Joseph Grinnell.
- GYLDENSTOLPE, NILS. A list of the mammals at present known to inhabit Siam. Journ. Nat. Hist. Soc. Siam, vol. 3, pp. 127-175. August 1, 1919. (304 forms are listed, with original references and notes on occurrence. The publication of such papers should be greatly encouraged.)
- HALL, HARVEY MONROE, AND JOSEPH GRINNELL. Life-zone indicators in California. Proc. California Acad. Sci., 4 ser., vol. 9, pp. 37-67. June 16, 1919. (Lists the plants and vertebrate animals used in determining the various life-zones of the state.)
- HAMLYN, JOHN D. The Okapi. Hamlyn's Menagerie Mag., vol. 5, no. 4, pp. 25-27. August, 1919. (Account of the living specimen received at the Antwerp zoological gardens, August 9, 1919. This animal died on September 29, according to a later note in the October Hamlyn's Magazine.)

- HAMLYN, JOHN D. Fate of the Addo elephants. Hamlyn's Menagerie Mag., vol. 5, no. 4, pp. 28-30. August, 1919. (Tells of plans being made for the extermination of the last remaining herd of South African elephants, 150 to 200 in number. The October number of Hamlyn's Magazine gives further details of methods used in the killing of these animals.)
- HAMLYN, JOHN D. The Addo Bush elephants. Hamlyn's Menagerie Mag., vol. 5, no. 7, pp. 51-55, figs. 1-4. November, 1919. (Protests against the extermination of this last herd of South African elephants.)
- HARMER, S. F. Subantarctic whales and whaling. Abstract, Weekly Evening Meeting (May 16, 1919), Roy. Inst. Great Britain, pp. 1-5. 1919.
- HINTON, MARTIN A. C. Notes on the genus *Cricetomys*, with descriptions of four new forms. Ann. and Mag. Nat. Hist., ser. 9, vol. 4, pp. 282-289. October, 1919. (*C. gambianus* of authors said to include at least four good species; new forms described from Sudan, Belgian Congo, Zanzibar, and Nigeria.)
- HOLLISTER, N. Report on the National Zoological Park. Appendix, Rep. Secy. Smithsonian Inst., 1919, pp. 68-81. December, 1919. (On June 30, 1919, the collection contained 528 mammals, of 156 species. Among the more unusual species for zoological park collections are the Apache grizzly, glacier bear, brown hyena, African cheetah, Rocky Mountain and Arizona mountain sheep, African and Sumatran elephants.)
- HORNADAY, W. T. Rational use of game animals. Reprinted from Wild Life; its Conservation and Protection, of the Commission of Conservation, Canada, pp. 1-11. 1919. (On the necessity for protection of game in the north, with special reference to the great game of Alaska; with suggestions for legislation.)
- HOWELL, A. BRAZIER. A new cotton rat from Arizona. Proc. Biol. Soc. Washington, vol. 32, pp. 161-162. September 30, 1919. (Describes *Sigmodon hispidus cienegae* from Pima County.)
- KLOSS, C. BODEN. See Robinson, Herbert C., and C. Boden Kloss.
- KOLLMANN, MAX. Sur la présence de l'os planum chez les Lémurines. Bull. Mus d'Hist. nat., 1919, no. 5, pp. 1-3. 1919.
- LOMEN, CARL J. The camel of the frozen desert. Nat. Geog. Mag., vol. 36, pp. 539-556, with 19 illustrations. December, 1919. (An account of the introduced reindeer in Alaska. The selection of such a misleading and inappropriate title for this article is unfortunate.)
- LÖNNBERG, EINAR. Remarks on some South American Canidæ. Arkiv för Zoologi, vol. 12, no. 13, pp. 1-18; figs. 1-4. 1919. (On the affinities of *Pseudalopex lycoides* Philippi and the dog of the Yaghan Indians, Tierra del Fuego.)
- LORD, CLIVE E. See Scott, H. H., and Clive E. Lord.
- MILLER, GERRIT S., JR. Bibliography, 1888-1918. Report VII of the Class of Harvard 1894, pp. 588-599. 1919. (Complete list of published papers, the majority of which relate to mammals.)
- MILLS, ENOS A. The grizzly, our greatest wild animal. 289 pp., 10 plates. Houghton, Mifflin and Co., Boston and N. Y., the Riverside Press, Cambridge. September, 1919.
- NELSON, E. W. Report of chief of Bureau of Biological Survey. Pp. 1-24. November, 1919. (For year ending June 30, 1919. The federal big game reservations in charge of the bureau contained on this date 368 bison, 274 elk, 54 antelopes, and 21 deer.)

- OSBORN, HENRY FAIRFIELD. The Congo expedition of the American Museum of Natural History. Introduction. Bull. Amer. Mus. Nat. Hist., vol. 39, pp. xv-xxvii. August 1, 1919. (An account of the expedition, its routes, and a summary of the collections made, together with a most excellent map showing the localities visited.)
- POCOCK, R. I. The classification of the mongooses (Mungotidæ). Ann. and Mag. Nat. Hist., ser. 9, vol. 3, pp. 515-524. June, 1919. (The family Mungotidæ is formally recognized and a key to its subfamilies and genera is given.)
- ROBINSON, HERBERT C., AND C. BODEN KLOSS. On five new mammals from Java. Ann. and Mag. Nat. Hist., ser. 9, vol. 4, pp. 374-378. December, 1919. (New forms of *Pithecius* [*Pygathrix* of recent authors], *Rattus*, and *Mycteromys*.)
- ROYAL ZOOLOGICAL AND ACCLIMATISATION SOCIETY OF VICTORIA. Fifty-fifth annual report and report of the annual meeting of the society, for the year 1918. Melbourne, 1919. (List of animals living in the gardens. An orang-utan has now been in the Melbourne collection for fifteen years, and is probably eighteen years old.)
- SCOTT, H. H., AND CLIVE E. LORD. Studies of Tasmanian Cetacea. Part II. Royal Soc. Tasmania, Pap. and Proc., 1919, pp. 23-32, 1 plate. July 24, 1919.
- SHUFELDT, R. W. The racoons of North America. Amer. Forestry, vol. 25, pp. 1531-1536, 5 figs. December, 1919. (Popular account of raccoons and their allies.)
- SPREADBOROUGH, WILLIAM. Notes on some of the more common animals and birds of the Canadian Rockies. Canadian Alpine Journ., vol. 10, pp. 51-68. 1919. (Interesting field notes on bears, marmots, ground-squirrels, pikas, wood rats, chipmunks, and squirrels.)
- SWARTH, HARRY S. Some Sierran chipmunks. With notes on photography of small mammals by Joseph Dixon. Sierra Club Bull., vol. 10, pp. 401-413, 3 plates. 1919.
- TAYLOR, WALTER P. Suggestions for field studies of mammalian life-histories. U. S. Dept. Agric., Dept. Circ., 59, pp. 1-8. September, 1919. (Mailed to all members of the American Society of Mammalogists.)
- TAYLOR, WALTER P. A new pocket gopher from western Washington. Proc. Biol. Soc. Washington, vol. 32, pp. 169-171. September 30, 1919. (Describes *Thomomys douglasii tacomensis* from Pierce County.)
- THOMAS, OLDFIELD. Two new gerbils from Sinai. Ann. and Mag. Nat. Hist., ser. 9, vol. 3, pp. 559-560. June, 1919. (Describes *Gerbillus floweri* and *G. bonhotei*.)
- THOMAS, OLDFIELD. The method of taking the incisive index in rodents. Ann. and Mag. Nat. Hist., ser. 9, vol. 4, pp. 289-290, with one figure. October, 1919.
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CORRESPONDENCE

ENGLISH NAMES OF MAMMALS

To the Editor, Journal of Mammalogy:

Not long ago it was my privilege to appear in "The Auk" as an advocate of English, that is, truly popular names for birds. The matter is largely a literary one, but all are agreed that popular knowledge of the bird is greatly helped by an exact, right, and acceptable name.

Precisely the same thought applies to Mammals, and I hope you will allow me to discuss it here.

For the diffusion of knowledge in an English-speaking country, one must have English names; a name to be popular in our language must be short and descriptive. It must be different from other names. If a foreign word, it must be composed of the sounds represented in our alphabet. It should tie the creature up with familiar ideas. It must be easily said, and it must be pat. It should be a monosyllable, or if of more than one syllable, it should have the accent on the first; otherwise it will hardly be English, and will stand much less chance of success.

Those of us who have known the west for a generation, have witnessed the triumphant march of the monosyllable.

The victory of 'peak' over 'mountain,' 'gun' over 'revolver,' 'rope' over 'lariat,' are cases in point. Or to keep to animal illustrations, note the displacement of 'Lobo' by 'Wolf,' of 'broncho' and 'cayuse' by 'horse,' of 'Kit-fox' by 'Swift,' of 'Polecat' by 'Skunk.'

The usual shortening of the word and the forward trend of the accent are shown in the successive names of *Canis latrans*. The early travellers bade us call it 'Small Prairie Wolf.' Then the word 'Coyote' (coy-o'-te) came from the South, with its three full syllables, the accent on the second. But the inevitable process set in, when it got beyond Mexican influence. It was shortened to 'Coyote' (coy'-ote), and sometimes flattened to 'Kyute' (ky'-ute).

Again 'sewellel' or 'showtl' are accepted book names of the 'Aplodontia.' They are fairly well established, good in construction; and probably unlike the original Indian words, for they have been Englished; but still they have no foothold in the memory, and are being very hard pressed by the undesirable names, 'Mountain Beaver' and 'Blue Muskrat,' which, being constructed of familiar elements, may put out the other names altogether.

'Prairie Marmot' is an example of bookish absurdity. Of course, it would not stand up against the pat 'Prairie-dog,' which in spite of one hundred years of books, is now firmly established in the books themselves.

Similarly no doubt, the victory of the strong, angular word 'Rabbit' over the shorter and rather featureless word 'Hare' is due to its patness, and the ease with which it may be said and remembered.

Among the animal names which have succumbed to these inevitable forces, I might further illustrate 'Wood-hare,' as the bookmen insisted on calling it for two hundred years, now admitted to be 'Cottontail;' 'Jackass hare' or 'Prairie hare' now 'Jack-rabbit;' 'Bay-lynx' now 'Bobcat;' 'Mephitic Weasel' now 'Skunk;' 'Striped Groundsquirrel,' now 'Chipmunk,' while 'Pika' and 'Little Chief Hare' have surrendered to 'Coney.'

The 'Varying Hare' of the bookmen is now fully established as the 'Snowshoe Rabbit.' The 'Maryland Marmot' is the 'Woodchuck,' and the 'Argali' of the early writers is now wholly and exclusively the 'Big-horn' or 'Mountain Sheep.' Sad to relate, however, I see many evidences that the monosyllabic trend is threatening to establish 'Sheep' on the grave of 'Bighorn.'

Part of last winter I spent on the Mohave Desert at a ranch, associated with some boys who were keen on natural history. *Onychomys* was plentiful and easily trapped. I gave the boys their choice of its various names, *Onychomys*, Mole-mouse, Bobtailed Deermouse, Grasshopper Mouse, and Calling-Mouse. I gave the reasons for each name, and asked them which they preferred. The first two did not receive very long consideration. 'Grasshopper Mouse' in spite of explanations, they thought too suggestive of 'Kangaroo-rat;' the hopping dominated their thought. All agreed finally, that 'Calling-Mouse' was the best name. A week later I found that this was the only one that they remembered, which seems to me a very important evidence of its value as a name.

I had a similar experience with 'Antelope Chipmunk' vs. 'Cottontail Chipmunk.' The latter was easy to say, pat, descriptive, and worked with familiar ideas. Antelope are unknown now, therefore 'Cottontail Chipmunk' won. So, also, 'Little 4-striped Chipmunk' had no chance with 'Snow-chipmunk.'

Every naturalist will recall examples of the same sort, and the struggle between the imitation English and the really evolved English name. The ultimate survival of the latter is inevitable.

There is one other case that should be considered, and that is 'Mammal' vs. 'Quadruped' or 'Animal.' The popular and English names for the creatures under consideration, are 'brutes,' 'beasts,' 'quadrupeds' or 'animals.' 'Mammal' is bastard Latin, not English, and seems never likely to be. 'Quadruped' was accepted by Audubon, Bachman, Kennicott, and many others, and has become English, for custom has excluded the frogs, lizards, and turtles from the quadruped list just as completely as it has the tables and chairs. But 'animal' is even more widely established now, and, in the restricted sense of 'mammal' is accepted by the Century Dictionary. We may as well do the same thing.

Of course the bookmen in defense of their position hark back to the original meaning, the derivation of the word. To this, I reply, such an argument, if allowed full weight, would abolish the English language altogether.

Original meaning has no weight whatever against national usage. These broad conclusions, then, will, I think prove acceptable:

That as soon as familiar with an animal, the popular mind evolves a name for it, and that name is nearly always better than the artificial product of some scientist.

That an enormous impetus is given to the study, as soon as we get good names.

Let us therefore accept the book names proposed until better are found, but let us encourage everyone interested to gather up, record, develop, suggest, or invent a good name, whenever the opportunity or the inspiration arrives.

Then we shall have the irresistible power of the genius of English backing the study, instead of bucking it, as at present.

Yours very sincerely,
Ernest Thompson Seton.

Greenwich, Connecticut,
November 25, 1919.

THE "GENERAL NOTES" COLUMN

To the Editor of the Journal:

Many members of the American Society of Mammalogists have signified their interest in the work of the Committee on Life-Histories, while those professing an interest in the work of the other committees are so far few in number. The reasons for this are perfectly obvious. The study of specimens, bones, and books is interesting; but the study of the living animal is even more interesting. It is perhaps not strange that because it is possible for persons without special training to acquire an interest in socalled popular natural history and because superficial and inaccurate observations have sometimes become current there has arisen in some quarters a prejudice against popular science.

Robert Ridgway once wrote "There are two essentially different kinds of ornithology: *systematic* or *scientific*, and *popular*. The former deals with the structure and classification of birds, their synonymies and technical descriptions. The latter treats of their habits, songs, nesting, and other facts pertaining to their life-histories" (*The Birds of North and Middle America*, Bull. 50, U. S. Nat. Mus., Part 1, 1901, p. 1). To the mind of the writer this distinction is a mistaken one. Is not the study of habits exactly as scientific as the study of structure? Structure acquires significance only as some habit is associated with it. It is, moreover, still an open question whether structure arose before habit, or habit before structure. Is not the distinction rather between the true and accurate and the false and inaccurate, whether one studies structure or habits, than between the *scientific* and *popular*? There is nothing inherently scientific about studies of specimens, bones, and books; nor anything inherently unscientific in studies of habits and life-histories. The scientific method can be applied as readily to the one as to the other.

I was impressed with your statement in the last number of this Journal that "Papers of general interest on life-histories, distribution, and habits are particularly needed, in order that the Journal may not be overbalanced with purely technical matter." With this proposition it is believed all readers of the Journal will be in agreement.

A tendency far too common among observers of wild life is to minimize the importance of their studies of habits. The dearth of information concerning the life-histories of some of our commonest mammals is amazing. It is consequently urged that papers and general notes in this province be submitted for publication. In particular the column of General Notes should become one of the most popular and best supported departments of the Journal.

It should be remembered that any sincere student with an enthusiasm for closer acquaintance with wild life can well become active in this field. "No human being and no book, but nature herself, is the supreme authority in natural history. The beginner may make as important an observation as the veteran investigator. The efforts of all are needed if our fund of information is in any sense to be complete" (Dept. Circular 50, U. S. Dept. of Agriculture, p. 4).

Walter P. Taylor.

LOCALITY, DATE, AND NAME WITH OBSERVATIONS

To the Editor, Journal of Mammalogy:

Your Journal is certainly a godsend in affording us restless ones a place to post our views and to learn those of others. You have been generous to me in giving me so much space for my observations, will you allow me a few lines to state some grievances, or at least to point out some wrong methods that have caused a great deal of unnecessary annoyance and loss.

1st. Observations given without place or date. I have before me a note on three Mink by a leading naturalist, but no date. If it was spring, it was highly significant—if it was autumn, it meant nothing.

2nd. Dating with numbers for months. Some use the logical sequence—day, month, year. Some, alas! including our Post Office officials use it “month, day, year.” I have before me a specimen from a leading museum with the field label on it marked 8/4/98 and the museum label 4/8/98. Which is it? Can’t we use Roman numerals for the month, or the established abbreviations, and end such muddles?

3rd. I have before me an adventure with a Lynx, by “Mr.” Mackenzie of Labrador. If it was Peter Mackenzie, it is valuable. If any of the 75 other Mackenzies it is interesting, but doubtful. If by Nicodemus or Ananias Mackenzie, it is waste paper. I would never use “Mr.” in such connection. It generally means that the recorder did not think it worth following up. Of course, “Dr.” or “Miss” or “Mrs.” are all right for they have identification force, but not “Mr.”

If Sir John Richardson had talked of “Thomas Hutchins” instead of “Mr. Hutchins,” it would have saved a world of trouble and prevented the injustice that robbed Hutchins of the credit of his great work.

4th. Citation, without mention of source. I have before me some observations on the jump of a Mexican Squirrel, quoted, without mention of source, by a modern writer. If the source was one well known Mexican traveller it is of the highest value, if by another that I have in mind, it should be scrapped.

Yours sincerely,

Ernest Thompson Seton.

Greenwich, Conn.,
20 December, 1919.

EDITORIAL COMMENT

The committee on life-histories of mammals promises to be one of the most active of the standing committees of the American Society of Mammalogists. President Merriam appointed as the chairman of this committee, Dr. Charles C. Adams, director of the Roosevelt Wild Life Forest Experiment Station, New York College of Forestry, Syracuse, New York; and asked the chairman to name the other members of his committee. Doctor Adams now announces his selections as follows: Dr. Rudolph M. Anderson, zoologist, Biological Division, Geological Survey of Canada; Mr. Vernon Bailey, chief field naturalist, Biological Survey United States Department of Agriculture; Dr. Harold C. Bryant, Bureau of Education, Publicity, and Research, California Board of Fish and Game Commissioners; Dr. Lee R. Dice, curator of mammals, Museum of Zoology, University of Michigan; Dr. Hartley H. T. Jackson, assistant biologist, Biological Survey, United States Department of Agriculture; Dr. T. S. Palmer, assistant biologist, Biological Survey, United States Department of Agriculture; Mr. Ernest Thompson Seton, Greenwich, Connecticut; Dr. Walter P. Taylor, assistant biologist, Biological Survey, United States Department of Agriculture; and Mr. Herbert Lang, assistant curator mammalogy, American Museum of Natural History. Mr. Lang is chairman of a subcommittee on exotic mammals. Good results may be expected from such a committee, and, in any work planned, the chairman may confidently look for the hearty coöperation of all the members of the Society.

The second annual meeting of the American Society of Mammalogists will be held in New York City, beginning Monday, May 3, 1920.

Since the first number of the Journal has been issued, many letters regarding it have been received. All speak enthusiastically of the initial number, and, as requested by the editor, many make suggestions for future improvement. Each criticism or suggestion has been listed and before the close of the year all will have the careful consideration of the committee on publications. It has been deemed best to make no conspicuous changes in the make-up, typography, or style of the Journal except at the beginning of a new volume, so there will be plenty of time to weigh carefully all arguments for proposed improvements. The most general of all these friendly, helpful criticisms is regarding the lack of articles on "life-history." If this is a serious fault, it is one for which the management is in no way to blame; and if we are to have a more nearly balanced magazine those members who are particularly interested in the habits of mammals must furnish the articles and notes for publication. It may be said, however, that several important contributions of this kind are already promised and it is expected that before long the pages of the Journal will contain a fair proportion of interesting papers on the life-histories of mammals.

The actual date of publication of the first number of the Journal of Mammalogy was November 28, 1919.

Mr. Seton's letter on the English names of mammals in this number of the Journal brings this troublesome question up for discussion. It is a matter that will bother the editors of the Journal for all time, for, unlike the case with birds,

the great majority of our small mammals have no common names, and authors are forever inventing them. Unhappily these newly invented names are often absurd, as Mr. Seton rightly says, and they very rarely fill any good purpose.

The truth is that at present comparatively few of our small mammals need specific or subspecific vernacular names; a single common name for all the members of a genus is frequently quite sufficient, and for writers of technical mammalogy to invent such names merely that their books or lists may be, in a sense, complete or consistent, is folly. The best plan unquestionably would be for authors of works on mammals to use only such common names as are actually in service; ignore ridiculous book names invented without sufficient cause; and, for a host of our species, wait until real names do appear in the language. If the comparatively few names introduced into the literature of North American mammals by Audubon and Bachman, and other early writers, have so signally failed, what then is the prospect for some of the later inventions now that our list of mammals has increased many-fold since those classic works were prepared.

The most ambitious recent attempt at giving all of our mammals common names was that of the late D. G. Elliot, who systematically coined English names for most of the American forms. Beginning with his *Land and Sea Mammals of Middle America and the West Indies* in 1904, and continuing through several later works on the mammals of America and other parts of the world, Elliot thought it necessary to provide every single species and subspecies with a vernacular name. Without, apparently, any serious attempt to find out what names might already have been given to a few of these creatures, in print or otherwise, he proceeded to coin as unreasonable a collection of names as could well be imagined. One of the principal sources for these names was the technical names of the mammals, which he merely translated into English. The results are wonderful to behold. How many persons, including the most learned of professional mammalogists, know today what mammal is named the fighting bear, the thievish coyote, dark coati, allied weasel, irrational shrew, prominent-eared bat, doubtful kangaroo rat, graceful bat, captious harvest mouse, Hamilton Smith's white-tailed deer, beautifully garbed chipmunk, cunning red-backed vole, trader spermophile, robust field mouse, beautiful mole mouse, least upland meadow vole, roaming pocket gopher, alien mouse, sand-frequenting pocket gopher, smallest spiny mouse, autocrat timber wolf, robber raccoon-fox, happy chipmunk, narrow-headed spotted skunk, or the curtailed fox? These atrocities are not carefully selected to show the horror of it all—they are listed at random in a few moments' time. There are hundreds equally bad, including the can-tankerous meadow vole, the cheating woodrat, the tricky coyote, and the degenerate otter. They were always carefully double-indexed in a special section called "Index of Common Names!"

Very few of these names have ever been copied by other writers and certainly none of them have worked their way into the language of the layman or of the amateur naturalist, for whose benefit it is assumed they were coined. Occasionally we see some of them in print, probably because some author thinks it advisable to use names already formally bestowed upon certain animals rather than to make new ones. But of what use are they? Why should we use them? They are not common names in any sense, and they never will be known even to men devoting their lives to the study of mammalogy. In listing mammals,

there surely is no harm in leaving some obscure species and many geographical races without special English names. If they have no English names, and many species are almost unknown to the residents of the region where they abound, it is far better to wait for the name to come naturally, as it will if required. How much better it is to have an open field for a good, real name, a "pat name," as Mr. Seton calls it, than to have our literature burdened with these utterly useless, hopeless, and impossible names made up on the spur of the moment by writers, merely to fill out their books, or perhaps reluctantly admitted because some editor, who knows nothing of the case, insists that every animal have an English name.

Common or English names are necessary for well-known species or groups of species. A few more might at present be useful for species-groups of such mammals as white-footed mice, meadow mice, wood rats, and others. Groups of forms known to hunters, trappers, naturalists in general, farmers and others, indeed most mammals that are commonly observed, or actually *need* them, already have good local names; if we but inquire among those familiar with the animals we may learn them and from them select good ones for use in print. Like the local names of birds, such names are sometimes used for different species in different localities. The pocket gopher is called salamander in Florida, where a tortoise is the gopher; and the spermophile is called gopher in parts of the West. This and other cases are as confusing as partridge and pheasant among bird names. In such cases it is perhaps best to persist in the use of a good book-name like pocket-gopher, spermophile, or ground-squirrel. If the name is a good one it may eventually win, just as ruffed grouse has become quite generally understood almost anywhere within the range of that species.

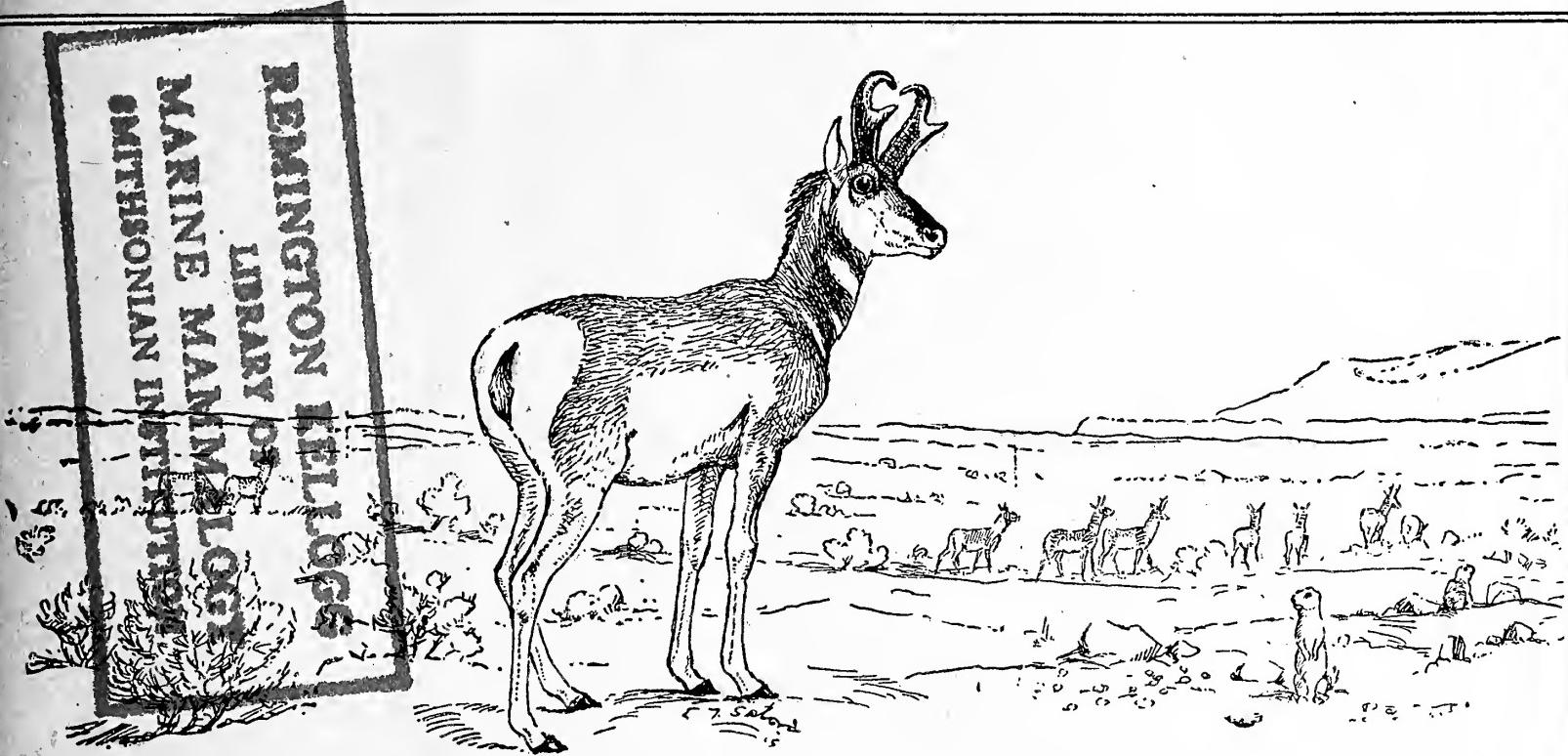
The common names in use for most distinct species of well-known mammals may be modified by geographical or other pertinent adjectives if it is necessary to have special English names for closely related forms or subspecies. But just because a form is recognized by the specialist, and is given a technical name, does not make it necessary that it have, at once, an English or common name differing from that of some closely related form, a form perhaps impossible for anyone except the specialist to distinguish. Only the specialist needs names for these slight subspecies, and he has provided the technical names for his own use.

Real, honest, actually-used local names should be collected, published, and made available. But let us stop coining absurd "book-names" for every small mammal we need to mention. And above all, let us cease to try to perpetuate or force into the language such names as listed above. They serve no purpose whatever, most of them stand no chance of survival, and it is perhaps actually harmful to use them in print.

—N. H.

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CONTRIBUTION TO THE LIFE-HISTORY OF THE CALIFORNIA MASTIFF BAT

BY A. BRAZIER HOWELL

[*Plates 5-6*]

Among the bats found within our borders, there is probably none more interesting than our largest species—the California mastiff bat (*Eumops californicus*). First discovered at Alhambra, California, by E. C. Thurber, it has always been considered decidedly rare, and is poorly represented in even our largest museums.

During the past year, I have had exceptional opportunities to study this form, and now after a great deal of hunting, which cannot better be described than by the word "snooping," poking my nose into every likely and unlikely place, and even advertising, I have no hesitancy in pronouncing it a common species in the orange section or thermal belt of Los Angeles County. However, to be successful in finding it, one must employ no little energy and perseverance. Almost all of my observations were made in the company of L. Little, and with his assistance.

I imagine that in the days before houses were built in this section, "mastiffs" were in the habit of roosting in cracks of occasional cliffs. Undoubtedly, they sometimes used hollow trees as well, but not to a great extent, for trees with cavities high enough to suit them were anything but plentiful. At present, they may be found in a variety of situations, such as attics, large warehouses, or cracks in high masonry, but the colonies are not nearly as populous as are those of most other bats. I consider that twenty is rather a large number for a colony, although as many as seventy may be found together. I have heard

rumors, which may or may not be so, of roosts of this species having been found but a few feet above the ground, and it is undeniably true that many single animals have been secured while hanging at a low elevation, but all five locations from which I have secured them, besides a roost "belonging" to L. E. Wyman, have been so situated that the bats had an uninterrupted drop of at least twenty feet before taking wing. I am so sure of the necessity of this point that I would not think of searching for them where this condition did not obtain. In the aggregate, I have spent hours studying dozens of individuals in my screened porch and trying to make them fly, but whether in January or during the heat of June, they all refused even to flutter their wings when dropped from as high as I could reach while standing upon a chair, although they were exceedingly lively and scrambled about the floor with the greatest celerity. I have even, at different times, caught thirty individuals which Little dropped to me from at least thirty feet above, and although they spread their wings so as to break their falls, not one tried to fly; and this on sunny and fairly warm days. Last spring, one entered the open window of a vacant room, alighted on a lace curtain and finally died—evidently because it could not leave with so little "take-off." I found one dead beneath the eaves of my cow shed, and another on the floor of a low building. I discovered about eighteen which had died in an attic because the ventilator at that end of the gable had been plugged, and they could not or would not fly the few feet to the other end of the building where there was a good exit. On the other hand, L. E. Wyman has succeeded in making several fly in his screened porch, although it was earlier in the season and presumably cooler than when I have tried the same experiment. The probable explanation of this is that unusually active individuals, or those which for some reason are in an unusually active condition, can take wing from low situations, but that the majority, especially during the cooler parts of the year, need to gain momentum by taking a long dive, before flying.

Somehow, *Eumops* has an exotic appearance, as if it were an accidental visitant to our fauna rather than an established resident. The genus is a tropical one, and our species seems rather hard put to it to survive. In large colonies of other bats, one rarely finds a dead individual. I have not only found dead mastiffs in every colony visited, but three others in haphazard spots as mentioned, and have heard of still more. One really would be justified in pronouncing it a case of the gradual elimination of the unfit if it were not for the fact that both available shelter and food, because of agriculture and irrigation, are much more abundant than they could have been in the past.

My first mastiff was secured October 23 from the ridgepole of a large, abandoned packing house a mile from my home near Covina, Los Angeles County, and was in such a position that we had to shoot it. This is not a regular roost, for there are few or no dark nooks for hiding, but its vicinity is a favorite hunting ground for several species of bats, and the mastiffs occasionally use it for a day or two at a time, for I found another there later in the winter.

The next find was near Colton, San Bernardino County, and was located through W. C. Hanna, to whose kindness we are especially indebted. It was situated in a crack between an outside timber and the wall of an old stone building, with a sheer drop below it of about thirty feet. On this building there were other similar situations, but there was a little old guano beneath only one other crack. This roost contained at least forty, and possibly sixty bats. Little, Hanna and I visited this on November 5, when eighteen were secured, equally divided between the sexes. Another visit was made to this colony November 24 and twelve more captured, but we could tell nothing in regard to the number remaining, except that there were quite a few crowded into a dark corner. On April 23 there were no bats there. I do not believe that our activities drove them away, for I have taken every bat from a colony and found more later. Rather do I think that they temporarily sought some other location for breeding, or that it was used as a winter roost only. However that may be, a less suitable spot for wintering it would be difficult to find. The stone which bounded one side of the cranny was very cold, of course, and in addition, the aperture of the space occupied was fully as large above as below, with nothing to shelter the inmates when the cold, driving rain of the winter storms beat upon them. Still, there were the desiccated remains of but two, and that is an unusually low mortality.

Another small colony was discovered March 20 in a large house within a short distance of my ranch. Previously, the bats had occupied the attic, but their noise was such a nuisance that the ventilators were covered with netting and the twenty or thirty bats thus imprisoned were caught and killed. At the time of my visit, I found two live bats between the slats of one ventilator, and in another, four, one dead and blown with small maggots, another dead only a few hours, and two others which were decidedly weak. This was at the end of a spell of cold, rainy weather, but I cannot see why these should die of cold and hunger while those secured on the eighteenth were fat and lively. A possible explanation is that the latter were in a protected situation,

while the ones in the ventilators were continually subjected to a cold draught, which may have rendered them torpid throughout a protracted period. When I secured these individuals, I surreptitiously pried loose a corner of the screening, and what was my delight, upon visiting the attic December 5, 1919, to find about seventy mastiffs in the gable. They were hung to the shingle studs beneath the sloping roof, a short row to a stud, and thus overlapping as if they were animated shingles—truly a sight to delight the heart of a mammalogist. I took a few of these and found that they were of both sexes, as usual.

A colony was located in a small, two story house near my place on April 15, the bats gaining entrance through a slatted ventilator at the end of the attic. It was a very old roost and the guano was thick beneath it. There were seven mummified bodies upon the floor, I captured thirteen live ones, and there were at least eight or ten more in some cracks, but they were very lively, keeping up a great racket while scrambling about their retreat, and braced themselves so securely that it required much persevering manipulation with the long forceps to secure them.

On March 18 we discovered a colony of thirteen mastiffs in the attic of a two story building near Azusa, Los Angeles County. From this we took ten. I visited this again on May 31 and took two females, but left a single male. At the other end of this attic was a colony of *Nyctinomus* and *Eptesicus*. When Little visited this spot in late December there were no bats present.

This species, like its near relative *Nyctinomus*, has a very penetrating odor—decidedly more so than that of most bats—and this will cling for months to a sack in which the animals have been carried. I have always found both sexes together, even just before young were to be expected, and the females outnumber the males by about two to one. The average measurements in millimeters, taken by myself, of ten males and twenty-two females, are, respectively for the sexes—length, 175 and 174; tail, 60.7 and 57; expanse, 540.7 and 526.

The gland on the lower throat with its external opening is easily overlooked when inactive, and indeed I have been able to find no mention of it in publications. Ordinarily, it appears externally as a tiny dent, and internally, the skin is here attached to the body by a sort of tendon. When the males are most active sexually, the gland swells, is then shaped like a small-holed doughnut of a grayish, cheesy formation, and measures 14 mm. in diameter by 4 in depth. This makes a corresponding swelling externally and the opening is much enlarged,

the surrounding hairs being moistened by the exudation of a slimy matter with a very strong odor. The glands were active in most of the males secured March 28, and in but one of those taken December 5. By the middle of April the glands have greatly subsided. As far as I am aware, all of the European bats which have been dissected and examined in this connection, have been found to breed in the fall, or at least some time during early winter. The incipient ovule then remains in a quiescent state in a manner and by a means on which it is not necessary here to dwell at great length. The embryo does not reach its place of development nor start to form until warmer weather and the consequent increase of chiroptine activity stimulate it to grow, and this beginning can be retarded for several weeks by keeping the prospective mother in a low temperature. There is no reason to suppose that most of our bats differ in this respect, although the phenomenon probably does not obtain with tropical bats. My experience has led me to believe that probably the rut does not begin at the same time with all males, but that its start may depend on the animal's condition or some indeterminate cause. At any rate, it has been ascertained that the rut of some English bats lasts for a comparatively long time, and fertilization probably takes place at any time during the winter that opportunity offers.

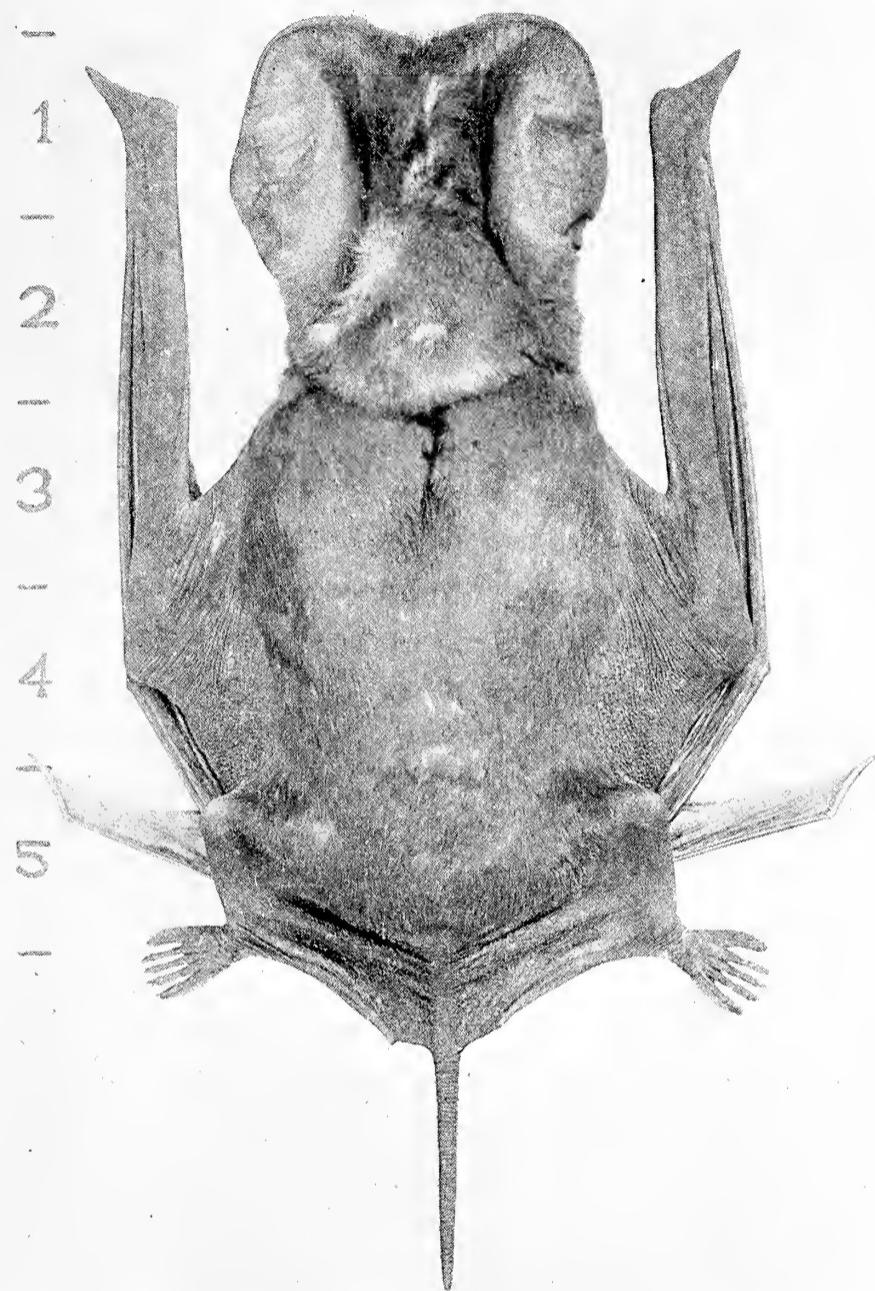
Females secured April 15 each contained a single embryo with a uniform length of three-quarters of an inch. As I was particularly anxious to examine the young and was leaving for the north the first of June, I took two females May 31 which were very heavy indeed. Had I known that it would be so long before the young appeared, I would not have disturbed them, but I had daily expectations while they were in captivity, and as they seemed to be perfectly healthy and cheerful, I kept one until June 30, when a young one was born, but it had then been dead for several days and I could not save it. It was surprisingly large and dull black in color. The other female I presented to the Museum of Vertebrate Zoology and it died June 14.

These bats may either hang in a horizontal row, or crowd singly into crevices. A favorite position is hanging vertically with the whole length of the legs hooked over onto a horizontal surface above, and slightly braced by the bend of the wings. They often vibrate the body gently for minutes at a time. Normally, the ears are held in the position shown in the illustrations, but the eyes are then concealed, so upon the slightest disturbance the ears are raised until the upper surfaces almost touch each other, and the animal will shrink away as far as

possible. Although their unwillingness or inability to fly at once renders them rather easy to catch, they try hard to escape by crawling. They are very pugnacious and can inflict a decidedly ugly slash with their needle-sharp incisors, as I can testify. When touched, they utter a shrill, chattering scream of astonishing volume, with the mouth opened to the fullest extent. The special formation of the lower jaw enables them to open their mouths to even a greater extent than is usual among bats, and this character must in some way be connected with their food or manner of obtaining it, but upon this point I can shed no light, for the stomachs of all those examined were empty. I have never succeeded in making a captive mastiff take food, even by placing a variety of insects in its mouth, but one of the captives kept by L. E. Wyman ate disabled insects, during the night. The bat seemed afraid of bulky prey like Jerusalem crickets even when they had been rendered helpless. However, if it habitually feeds only upon small fry, then for what is that huge mouth?

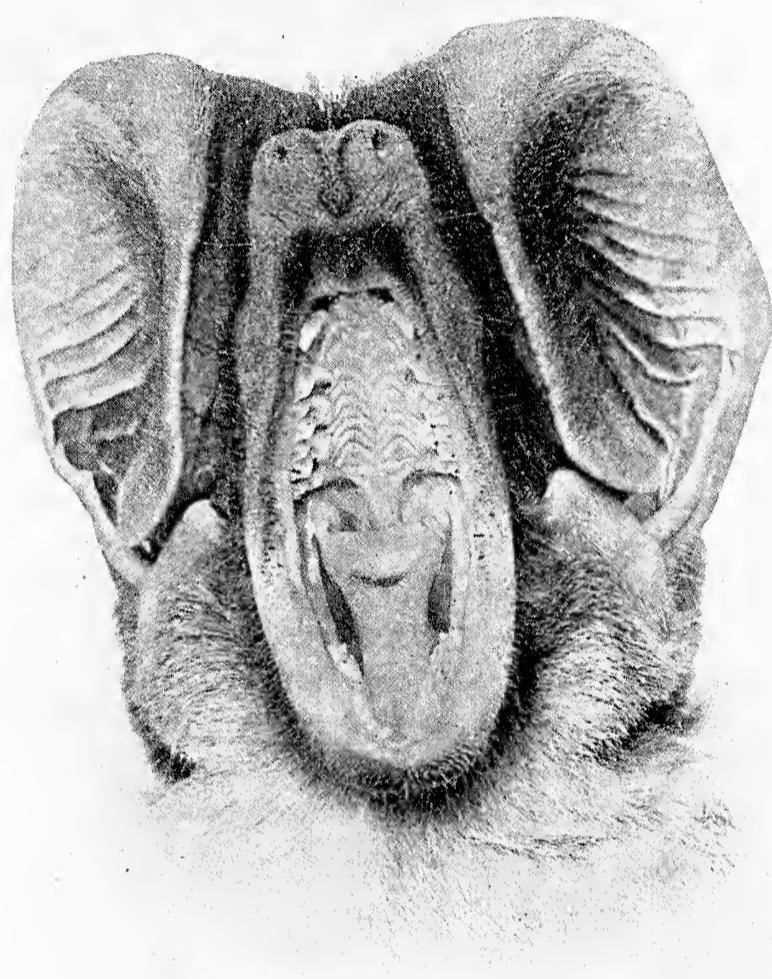
Eumops shares with *Nyctinomus* the distinction of being among the most agile of bats while on the ground. With wing tips folded above the back so as to be out of harm's way, they scutter across the floor in a sort of gallop, while the action of their "arms" reminds one of nothing so much as an "over-hand" swimmer.

I have found that certain bats which spend the summer in the southern part of California and migrate at the approach of cold weather, can go without food for very little more than forty-eight hours without dying, and this is as might be expected. They shun the cold and there are seldom or never any storms during the summer that continue long enough to prevent them from securing at least a little food every night. However, those which spend the winter, even in our thermal belt, must be of sterner stuff. The winter storms are not precisely warm and often last for three days or more. In addition, there may be a solid week of cold weather with ice every night, and although this does not distress *Nycteris*, for instance, I do believe that it would keep *Eumops* indoors. Hence, it is necessary that the mastiffs be able to fast, and fast they can. Although not hibernating in the true sense of the word, they enter what may be called a voluntary hibernation or torpid sleep. If placed in a cool situation, even late in the spring, they become torpid, cold, and to all appearances, dead. I kept one thus from November 5 to December 13, and usually, when examining her daily, I was obliged to shift her wings into different positions before I could detect the slightest sign of life. However, no matter how cool the day, disturbance



DORSAL VIEW OF CALIFORNIA MASTIFF BAT
(Reduced)

(Howell: The California Mastiff Bat.)



HEAD OF CALIFORNIA MASTIFF BAT
(Twice natural size)

(Howell: The California Mastiff Bat.)



for a few minutes was sure to rouse her ladyship into full vocal and muscular vigor. She refused all food, and at the end of six weeks, quietly died, although she was not emaciated and still had a slight reserve of fat. However, I am satisfied that the mastiffs take regular flights during the winter, when the weather and the state of their appetites are both propitious. During the middle of February, when there was a skim of ice almost every night, one roosted in the old packing house previously referred to, but stayed for only three days at most, and Hanna saw several leave the Colton colony one evening during the winter.

As far as I am aware, no one has ever observed this species while it was hunting. Several times, just at sunset, very large bats have flown towards the hills, singly, at a great height above the ground, uttering strident cries which were plainly heard inside of my house. These, D. R. Dickey and I took to be mastiffs. On the other hand, Hanna and I have each observed them leaving the roosts at very late dusk, dropping plummet-like from the exits and curving away when almost to the ground. Habitually, they must be late fliers, and possibly move at a considerable height above the ground, for they are too big to go unremarked if awing before dark. I have ascertained that the evening flight lasts for only about three-quarters of an hour, and they then return to roost. Presumably, there is another flight just before dawn, but I have never verified this supposition.

MAMMALS OF THE ST. MATTHEW ISLANDS, BERING SEA

By G. DALLAS HANNA

The St. Matthew Islands are located in Bering Sea about 220 miles to the northward of the Pribilof Islands, and about the same distance west of the Alaskan mainland. The group consists of three islands, which, named in order of size, are St. Matthew, Hall, and Pinnacle Islands. It was made a bird reservation by executive order of February 27, 1909, being officially known as the Bering Sea Reservation. Owing to the distance of the islands from the regular channels of travel, opportunities for naturalists to visit it rarely occur. It is barren, treeless, uninhabited and surrounded by dangerous and poorly charted waters.

Through a request of the Biological Survey of the Department of Agriculture I was detailed to make an examination of the reservation in June, 1916, but owing to the fact that the ice packs remained in that vicinity until after the middle of the month this was impossible. In July, however, the trip was made, and six days were spent on St. Matthew and Hall Islands. Arrangements having been made with the Coast Guard Service for transportation, I left St. Paul Island on the morning of July 7, on the Cutter *Unalga*, Capt. F. G. Dodge in command. The next morning the spires of Pinnacle Island were in full view and at noon a landing was made on St. Matthew near Cape Upright. Between then and the twelfth almost the whole of this island was examined, and on the thirteenth we went to Hall Island. Pinnacle Island was not visited on account of adverse weather conditions. I wish to express my appreciation of the favors extended me by the Coast Guard Service and especially by Captain Dodge and the crew of the *Unalga*, every man of whom willingly and eagerly assisted me on every occasion.

St. Matthew Island is about 22 miles long by two to three miles wide and is slightly curved to the north. Its mountains rise as high as 1800 feet and are in most cases, weather-worn and smoothly eroded. Some of them have mosses and lichens growing to the tops, but others, especially in the center of the island, are entirely devoid of vegetation. The rocks forming these latter are weathered into very small fragments, set edgewise and close together and making a natural pavement.

Most of the valleys are covered with reindeer lichen and mosses and in many favorable places there are true tundra bogs. Vegetation other than mosses and lichens is dwarfed and scant in most places. The rank growths of wild parsnip and wild rye found on the Pribilos are entirely absent. There are a large number of fresh and brackish water

lakes on the island, many of which have been formed by the sea-built dykes extending from one headland to another. The tide ebbs and flows in some of these, forming lagoons. There are a large number of fresh water streams, many of them a dozen feet across. They wind through the tundra swamps with undercut banks which form ideal spawning and feeding places for the innumerable trout found here.

The mountains are cut into by the sea on every side of the island, making long stretches of towering cliffs, between which the sea has built up beaches of such an extent as to give the impression that the island is much older than the Pribilofs. These cliffs display wonderful geological formations. There are beautiful blues, yellows, greens and bright reds in layers or dykes, and in places throughout the mass run seams of pure white calcite from two to twelve inches thick.

Evidences of comparatively recent earth disturbances are seen about two miles below Cape Glory of Russia on the south side of the island. The earth and cliffs are torn and tumbled in the greatest confusion. New slides are seen and the beach line boulders are not much rounded. In some places rocks are constantly falling, making it dangerous to go beneath the cliffs. Here are nodules from two inches to two feet in diameter composed of a green mineral-like jade, and there are numerous seams in the country rock of banded agate. There is one cliff half a mile long of undoubted sedimentary origin. Numerous fossilized trees, some two feet in diameter, are embedded near the base. All seen were in a recumbent position and as black as anthracite coal.

The large number of cliffs with their grand scenic display are notable as the nesting places of countless sea birds. Of all the places I have visited St. Matthew is rivalled in this respect only by that incomparable bird cliff on St. George Island, but the ledges on St. Matthew are more nearly perpendicular and thus afford less favorable nesting sites. The lines of driftwood indicate that the island as a whole has had a recent elevation, or that some enormous seas which did not reach the Pribilofs carried the logs high above tide-mark. Some logs are about 100 feet above the calm weather water line.

Hall Island is entirely bold and rugged and has no true beach. In fact the top of the island can only be reached in a few gullies where small streams empty into the sea. The vegetation and character of the upland appeared similar to St. Matthew. Pinnacle Island is wedge shaped and has towering spires projecting high into the air. It is so steep and rugged that snow does not lie upon it. Probably the base of the cliffs might afford a landing place in calm weather but whether or not the walls of the island could be scaled was not ascertained.

The action of the ice on these islands seems inconsequential. No worn pebbles were found back of the beaches nor are glaciers present. Snow probably remains most of the summer in some of the canyons, since it was very deep in places in early July.

LIST OF MAMMALS

Whales.—The vicinity of St. Matthew Island has long been known for the abundance of whales at certain seasons. The great numbers of bones of these animals on the beaches, as compared with such islands as the Pribilofs, is an indication of their relative abundance. The conditions attending this investigation prevented the collection of a series of specimens of the several species identified on the beaches, and the positive determination of some of the kinds which may be represented there and in the surrounding waters.

Balaena mysticetus. Bowhead Whale.—The bones of this species are exceedingly abundant on all beaches. A pair of mandibles 19 feet long were found in the center of the long north shore beach and vertebræ by the hundred were observed; some were far back of the high tide mark, half buried in the tundra, and others showed fresh and white among the drift logs. Two skeletons lay bleaching on the south shore abreast of Pinnacle Island.

Balaenoptera velifera. Humpback Whale.—A skeleton of this species lies scattered on the south side of the spit connecting Cape Upright with the main portion of St. Matthew. The longest pieces of baleen were about four feet.

Sibbaldus sulfureus. Sulphur-bottom Whale.—A skull with baleen of this species was found on the spit connecting Cape Upright with the main island.

Orcinus orca. Killer Whale.—Bones of a killer were noted in two places on St. Matthew, those most recent being on the north shore near the center of the island.

Berardius bairdii. Baird's Whale.—A carcass of this rare ziphoid had washed into the lagoon on the south side of St. Matthew Island, two miles below Cape Glory of Russia. The skull was in good condition but rough weather prevented the taking of a boat around to the place, and it could not be carried across the bogs to the other side. A periotic bone was preserved however and the identification verified by True's excellent work on this family (Bull. 73, U. S. Nat. Mus.). This specimen seems to mark the known northern range of the species.

Phoca sp. Hair Seal.—A colony of hair seals was found by Captain Dodge July 8 on an outlying rock abreast of Waterfall Head, but no specimens were secured. From the number of young observed he was led to believe the place a breeding rookery. Another lot was seen on the north shore near Cape Glory of Russia but all shots miscarried and efforts to collect good specimens were unsuccessful. Two imperfect skulls were found on the beaches and they represent two species.

Odobenus divergens. Walrus.—A herd of about 500 was seen near the middle of the north shore, cruising along with the ship. Walrus skulls were common on the beaches and the officers and men found several pieces of ivory. They haul out on the northwest cape of Hall Island under the high cliffs, so I am told by

Captain Lane, but at no other place on either island. Five carcasses were found on the beaches, all of young animals which had been crushed by the ice. I am led to believe that the majority of these animals which are washed ashore have been killed in this manner. Four carcasses came ashore on St. Paul Island and three on St. George Island during the winter of 1915–16, and examination of two of these proved that they had been crushed. Some floaters may occasionally come in after having been shot; but it seems that, since hunting is prosecuted at such a distance from the Pribilofs, their bodies would be somewhat decomposed before they could float so far, even if the currents were favorable, which is unlikely. Occasionally pelagic hunters may come close by however and the shot animals might be found in a good state of preservation.

Callorhinus alascanus. Fur Seal.—Fur seals were common up to within eight miles of St. Matthew Island in June, 1916. While the ship was endeavoring to reach the island eight animals in all were seen by me, and more were noted by the men on watch. I did not see more than two together. The presence of these animals here at this early season led me to believe that possibly a new hauling ground had been established on the St. Matthew group. Investigation of most of the St. Matthew coast line in July, however, revealed no signs of such a hauling ground nor were any animals seen in the waters of that vicinity.

Alopex hallensis. White Fox.—The white fox is fairly common on the reservation. Animals or evidences of them were seen at every landing. One adult female was collected, and two skulls were found. Two trappers spent the winter here in 1912–13 especially for this species and I heard from one source that their catch was almost worthless and from another that it was of considerable value. Their success is doubtful since the attempt has not been repeated. Undoubtedly the number of foxes ordinarily present depends on the food supply, which under natural winter conditions cannot be large.

It has been proposed to lease St. Matthew Island for a fox farm, but as it is ice-bound for many months of the year, even to the middle of June, as in 1916, this would seem an unwise action. It would be impossible to procure food for a surplus of stock in winter without preying upon those forms of animals which at present it is desired to protect. An insufficiency of food would certainly lead to cannibalism among the foxes or to their wandering away on the ice pack. It would seem therefore that to grant a lease for a fox farm here would mean only an exclusive privilege of trapping the natural stock. If the time should come when the foxes would seem to be exterminating certain species of birds or other animals which it is considered of greater importance to perpetuate, then it will be time to take all foxes away from the island. Not until then should the natural balance be disturbed.

It is understood that the two trappers who were on St. Matthew Island during the winter of 1912–13 kept a journal which is now in the possession of the Coast Guard Service in Washington.

Thalarctos maritimus. Polar Bear.—In 1874, when Elliott and Maynard landed on St. Matthew in midsummer, polar bears were very abundant. There is a tradition that during the time of Russian occupation a party of five men from St. Paul Island landed on Hall Island where they built a cabin but had to leave it owing to the marauding of the bears. The remains of an old Russian house were found on that island. Captain Lane told me that bears were found up until

sometime in the 90's when a party from the revenue cutter Corwin landed and shot 16.

The old trails Elliott mentions are still plainly seen, worn deep into the tundra. Skulls of several animals were found, all with bullet holes in them, and two were preserved. Very probably a few bears may still come down in winter on the ice pack but they have been hunted so much of late years that they cannot be common.

Microtus abbreviatus. Hall Island Meadow Mouse.—Runways of rodents completely undermine certain large areas of both St. Matthew and Hall Islands, but at the present time most of them are unused. Indeed "fresh signs" of mice were rarely found and the result of my trapping is a single adult female, skin and skeleton. The remains of others were collected in owl pellets and there appears to be more than one species. This material has not been critically examined, but in all probability it includes bones of *Microtus a. fisheri* Merriam, described from specimens taken on St. Matthew Island in 1899 by Dr. A. K. Fisher, during the visit of the Harriman Expedition.

NESTS OF THE WESTERN FOX SQUIRREL

BY H. L. STODDARD

[Plate 7]

All accounts of the habits of the western fox squirrel (*Sciurus niger rufiventer*) that I have been able to find, speak of the young as being brought forth in hollow trees, no mention being made of the carefully constructed open nest used for this purpose in parts of the range of this squirrel.

In the sand dunes of northwestern Indiana particularly, where fox squirrels are still fairly abundant, the young born in early spring at least are usually brought forth in a very ingenious type of open nest, though hollow trees are common. These nests are round or oval in shape, tightly woven of freshly cut oak or other tough twigs. Inside of this twig shell comes a thick compact wall of large leaves, evidently pressed into shape while damp, making a smooth, tough lining capable of resisting wind, cold and rain. The nest proper is then made of soft inner bark, shredded leaves and other material.

The entrance hole is on one end and is just large enough to admit the owner, the surrounding fiber often nearly closing the opening. The accompanying figure, which is from a group prepared for circulation in the Chicago schools by the N. W. Harris Public School Extension of Field Museum, shows a typical nest in the original crotch, with one side removed to show details of construction.



NEST OF THE WESTERN FOX SQUIRREL
(Courtesy of the N. W. Harris Public School Extension of Field Museum)

(Stoddard: Nests of the Fox Squirrel.)

These nests are entirely different from the loosely constructed summer nests, and are so compactly built that they frequently remain in place many years, the squirrels using them a great deal even in coldest weather. From the ground they look something like hawks' nests, piles of sticks being all that are visible.

The three or four young, blind and nearly naked, are born in late February or March in this region, as the following records show. Nest containing three young near Millers, Indiana, March 8, 1914. Another nest located near-by the same day by my companion, Mr. L. L. Walters, contained four young about two weeks old. Millers, March 17, 1914, four young, about two weeks old; Dune Park, Indiana, April 1, 1917, three young a week or ten days old. I have never found a second litter later in the season.

Other nests of this type containing young, and dozens of empty nests examined by Mr. Walters and myself, have invariably been placed in pine trees, from twenty to forty or more feet above the ground. As a nest of this type must be built from the inside, a foundation of encircling limbs such as is offered by the northern scrub pine is necessary and may explain the absence of domiciles of this nature in the greater part of the range of this squirrel.

These winter nests are often placed in close proximity to some good old den tree, to which the squirrel can retire if disturbed, and the surrounding trees are likely to contain one or more of the temporary nests used in summer, simply twigs and leaves cut green and piled into a convenient crotch.

Young squirrels were found on a number of occasions in Sauk County, Wisconsin, in nests identical with those found in the Indiana dunes, even to being built in scrub pines, though the use of hollow trees is more general in that section, and the season later. On one occasion while examining a nest of this kind in a very small scrub pine the female squirrel jumped the sixteen or so feet to the ground, leaving one young one, just born, in the nest; proving that in this case at least the young had not been transferred from a hollow tree.

THE TEST OF THE SUBSPECIES

By P. A. TAVERNER

In the *Journal of Mammalogy*, Vol. 1, No. 1, pp. 6-9, appears an article by Dr. C. Hart Merriam advocating that the amount of differentiation be used as the test of specific or subspecific status, rather than the generally accepted one of intergradation. It is with some trepidation that I dare take direct issue with so eminent an authority but the case seems so clear against the proposal and its acceptance is so fraught with possibilities of confusion that I feel justified in lodging a protest.

Doctor Merriam makes much of the uncertainty of human judgment in estimating the probability of intergradation when direct evidence of it is lacking. For the sake of these minority cases where the human element may give varying results, he advocates the recognition of the amount of difference exhibited rather than the presence or absence of intergradation as the test for specific status; thus throwing open each and every case, instead of an occasional one, to the uncertainty of personal standards of judgment. It looks like out of the frying pan into the fire and the choosing of the greater instead of the lesser of two evils. Under the one standard we have numerous cases where intergradation can be demonstrated and subspecific status fixed. Under the other all are equally uncertain. It would seem more logical to go to the other extreme and ascribe every difference to the specific that cannot be demonstrated to intergrade with others. This would however be carrying logic to an extreme and I see no real reason why we should not continue to rely upon the good judgment of experience to assume the probability of intergradation where data is incomplete, readjusting mistakes according to new evidence. Finality can thus be gradually approached even though it may never be perfectly attained. The occasional transference of species to subspecific status and the converse are not serious disturbances so long as we keep the fundamental differentiation in mind and remember that in many cases intergradation is hypothetical and still awaits demonstration.

It is also more than probable that a strict adherence to the proposed criterion would land us in greater confusion than we experience now. Under it, on the evidence of specimens on which most of our conclusions are based, we would class the gray-cheeked and olive-backed thrushes as mere subspecies whilst the extremes of such forms as song sparrows, fox sparrows and horned larks we would raise to full specific status.

It is beside the question that in some particular cases such a proceeding might conceivably be an advantage for it is recognized that extremes of obvious subspecies sometimes differ more in apparent characters than do other distinct species. It is thus apparent I think, from the standpoint of mere expediency, that the amount of divergence as a test of the lower systematic units is open to serious question.

The only logical ground for applying a quantitative rather than an intergradational test to the subspecies is that of the instability of species. If species are liquid quantities flowing imperceptibly into each other the amount of difference by which they are characterized is the only practical means for their recognition. If, however, the species is a definite entity it must be cut off sharply from all other similar entities and degree of divergence becomes unimportant and isolation (discontinuity) its final test. Herein lies a conflict of ideas.

Those who concentrate their attention on the paleontological evidence are prone to regard the species as a mere concept, an ever varying quantity in constant state of development, adopted for convenience in referring to arbitrary points along a continuous line of progress. The modern zoologist however finds species the termination of lines of descent, and each sharply marked off from the other. As both of these reasonings are demonstrable it is apparent that in the word "species," as generally accepted, we have lumped two separate concepts. Certainly contemporaneous and consecutive species bear fundamentally different relations to each other and between themselves, and eventually will probably have to be differentiated by systematists. It is only the fragmentary nature of our geological evidence that has heretofore concealed the essential difference between species merging into each other along a line of descent and species the outcome of independent lines of descent. Intergradation is a concomitant of the first but incompatible with the latter.

It can be urged that evolution is an always present activity, that the processes of the past are continuing in the present and any system founded upon the stability of the species is doomed to eventual confusion. This may be correct philosophically, but in practice need hardly be considered in dealing with modern material. Within historical times we have absolutely no evidence of serious evolutionary change. A system that would have sufficed for three thousand years in the past will probably do for an equal time in the future. By the time evolutionary change introduces serious disturbance in the present scheme of things it is probable that our whole classification system will have been

scrapped for something better or else altered beyond recognition. In the meantime I think we are safe in basing our working system on the convention that existing relationships are practically stable.

Though all standards of taxonomic measurement are not mutually transferable between paleontology and modern zoology it does not follow that paleontological evidence should be neglected by modern systematists. As its evidence increases and its lessons become plainer, paleontology must be, even more in the future than it has been in the past, the rule and guide of our classification. We should however bear in mind that concepts that apply to the one may require modification before they can be transferred to the other.

However otherwise it may have been in the past or may be in the future, at the present moment or on any one given geological horizon, the species is a definite entity and its essential character is its genetic isolation. Absence of intergradation with other forms is the only test of the species as it exists at present. There is a barrier that isolates modern specific groups one from another, individualizes contemporary species and prevents wholesale mongrelization. Just what this barrier may be we cannot say with confidence, nor is it altogether necessary to the present argument to do so, but the agent that seems most capable of producing present results is the degree of fertility between such groups. When fertility between divergent forms breaks down, when differentiation progresses to the reproductive processes sufficiently to form a handicap to crossbreeding, genetic isolation ensues that forever separates the varying branches of a common stock and a new species is born. Whatever the mechanics may be that tend to hold a species true and prevents promiscuity, subspecies are incipient species, and I do not see what they can be but variations tending towards, but not reaching, specific status until connection with other forms (intergradation) is broken down and isolation established. Thus intergradation is not only an indication of a condition but it is the condition itself and the refusal to recognize it as the essential quality of the subspecies seems to be a denial of fact. It should be admitted, and can be without discrediting the fundamental argument, that intergrades will not always be discovered. Material from critical localities may not be available or connecting distributions may be obliterated through geographical or ecological changes. Subspecific variations may appear in disconnected communities and give rise to discontinuous distribution where even intergradation through individual variation may conceivably be obscured without in any way denying the relative status of

the forms concerned. The accidental absence of intergrades in these cases complicates the demonstration but cannot alter the fundamental facts. No system of classification has ever entirely done away with the necessity of exercising some judgment and probably none ever will, and the best we can arrive at is to reduce the human equation to its lowest possible terms consistent with the facts of nature. The *possibility* of intergradation where contact between races is physically impossible must necessarily be estimated under the guidance of what evidence we have. The test of intergradation or its possibility where physically prevented gives a far more definite basis of judgment than unmeasurable generalities expressed as vague comparatives of difference. That such proceeding does in practice and in some cases, approximate the criterion laid down by Doctor Merriam is beside the point as the resemblance is superficial and not fundamental. In one case it is frankly an expedient, a suggestion or means to an end, in the other it is the end itself and final.

In this argument I do not forget such cases as the hybrid flicker nor Lawrence's and Brewster's warblers. These if anything substantiate the view that degrees of sterility form the specific boundary lines. That the parent forms of these anomalies are not mongrelized is evidence that such cross breeding is under a handicap as against purer lines of descent; for it is a mere matter of mathematics to prove that otherwise species that hybridize regularly, even if only occasionally, would eventually merge. I have little doubt that the hybrid flicker which shows no appreciable evidence of sterility is only continued through fresh crossings of original stock and that should either parent form be exterminated, it would in a few generations die out through inherent weakness and inability to compete with either of its more virile parent forms.

Therefore, for reasons of both expediency and philosophy, stability of nomenclature and the teachings of evolution, I respectfully submit that the fact of intergradation is the only proper and workable test of subspecific status and should be firmly held to by all students of speciation.

OLD AND NEW HORNS OF THE PRONG-HORNED ANTELOPE

By VERNON BAILEY

[Plate 8]

The fact that our so-called antelope sheds and renews his horns each year has come at some time as a distinct surprise to every student of mammals—it has seemed to him almost impossible of belief and difficult to explain. Much time and space have been devoted to the study of the shedding and renewing of the hollow horn of this animal, and it is still safe to assume that we do not know all about the process. The history of our knowledge in regard to it presents an interesting chapter of doubt, disbelief, and discussion.

For over thirty years I have been for part of almost every season over some of the antelope country and have followed the herds on their summer, winter, spring, and fall ranges. I have found many skulls and skeletons, but never until recently have I found, or heard of any one finding, in the open country, a shed horn of this animal. In Yellowstone National Park, on April 7, 1916, at the edge of a melting snow bank near Blacktail Creek, I picked up a fair sized horn of a buck antelope that evidently had been dropped in the soft snow of the preceding fall or early winter and thus was protected from coyotes until the snow melted away. It was wet and soft and leathery about the base and had the strong hartshorn (ammonia like) odor characteristic of these horns. It could not have remained uncovered very long without being found by the keen-nosed coyote, who, being in the usual hungry condition, would certainly have made a partial lunch on its edible base and probably buried the rest to become more mellow with time and moisture. This seems the most reasonable explanation for the scarcity of shed antelope horns. The horn was carefully wrapped in a handkerchief, brought to camp, and dried until hard; it was then photographed and placed in the Biological Survey collection in the National Museum. The photograph shows imperfectly some of the long white hairs lining the base of the hollow horn. These hairs had pulled part way out of the shell as it had loosened from the bony core to make room for the growth of its successor, and while they show only at the edge in the illustration, they really cover the inner surface of the horn for a considerable distance.

On March 9 of the same year I found a fully grown young buck antelope that had been killed and partly eaten by coyotes. It had



1

2

FIG. 1. NEW GROWING HORN OF MALE ANTELOPE, WITH HARDENED TIP AND SOFT,
[HAIRY BASE, TAKEN MARCH 9

Beginning of prong shown by knob on left near base. Reduced from $6\frac{3}{4}$ inches in a straight line from top of curve to base.

FIG. 2. SHED HOLLOW HORN OF ANTELOPE PICKED UP APRIL 7 AT EDGE OF SNOW-BANK
IN YELLOWSTONE PARK WHERE DROPPED IN FALL OR EARLY WINTER

Showing much of the old hair at edges and inside of horn, and traces on outer surface. Reduced from $10\frac{1}{2}$ inches in straight line from tip to base.

(Bailey: The Prong-horned Antelope.)

half grown young horns standing about 7 inches up from the crown, with hard horny tips extending back about 3 inches from the points, and soft skin covered with long coarse hairs over the rest of the horns. These long black and white and gray hairs were firm and wiry like the hairs of a cow—not soft and spongy like the hair over the antelope's body. They were growing from the surface of the black, soft skin and evidently later would have become embedded in the horny covering as it thickened and hardened into the rough, strong shell of the ripened horn. As the horn thickens and hardens from the tip downward, this hairy covering is buried, rather than absorbed, and becomes a part of the horn. It furnishes a good illustration of the recognized fact that the horns of the Antilocapridæ as well as of the Bovidæ are but a modified form of hair growth.

Near the base of this horn, on the side opposite the point, is a swelling with a little naked knob or point where the side prong is beginning to show. This knob, which has a permanent position marked by a bulge on the side of the bony horn-core, indicates approximately the middle of the anterior edge of the core. The process of ripening and hardening from the point downward toward the base is evidently long and slow, but even in this young horn there are three inches of good hard point, and evidently before the horns become fully matured to the base in mid-summer, they might be very useful for defense. They are mainly, however, weapons for the fall tournaments in which the bucks fight for supremacy.

These facts recorded while fresh in mind may add something to the already voluminous reports on this most unique of our North American mammals. Every item of information in regard to the prong-horn should be saved for the species is steadily and surely slipping away from us and unless more intelligent study of their habits and requirements are made and more effective protection than state laws have ever afforded be given them, the next generation will know them only by the written records and a few museum specimens.

SKULL MEASUREMENTS IN THE NORTHERN VIRGINIA DEER

BY JOHN C. PHILLIPS

Several years ago it occurred to me that a large series of measurements of skulls of a selected species from a restricted area might be of general interest. In the first place, if the figures were carefully tabulated and subjected to a biometric analysis they might point out the relative values of the different skull measurements. By "relative" value I mean value to the systematist, as shown by their constancy (lack of variability). By working with sufficiently large series, it seemed that the coefficients of variability of the different skull measurements might be compared directly, one with another, and thus subjected to the acid test.

Another question was that of the maximum and minimum variation within the race or subspecies, a study of which might form a basis for comparison with other races.

It was also thought that in taking a large mammal, the actual technique of measurement was subject to less error, and as the northern Virginia deer (*Odocoileus virginianus borealis*) was the only large species available in any numbers, it was accordingly chosen.

Special care was taken to throw out any specimens that were not fully adult, and after measuring 109 skulls of males, 13 of them, having an antler length of 38 cm. or under, were discarded, as being perhaps not fully developed. The remaining 96 specimens represent, in my opinion, a selected class of adult males with antlers between 38 cm., and 72.5 cm., and an average of 47.6 cm. The type of *O. v. borealis* in the Museum of Comparative Zoology has antlers 66 cm. long. A series of skulls of females was not available.

All these deer heads came into the taxidermist shop of Mr. M. Abbott Fraser of Boston, and they were nearly all secured in the Boston market, being picked out because of their value for ornamental purposes. Practically all came from northern and eastern Maine, and possibly one or two from northern New Hampshire and Vermont. (One I am certain was from Vermont.) I am indebted to Mr. Fraser for placing this material at my disposal.

It is probable that these animals are four years old, or older, and a few showed by their worn teeth that they had about reached the extreme age limit.

A word of explanation is necessary in regard to the way the various measurements were taken.

1. Palatal length. (From back of posterior molar to gnathion.)
2. Audito-basal length. Owing to the fact that the posterior end of many of these skulls was damaged in the taxidermist shop, in process of getting out the brains, the condylion could not be utilized in taking the condylo-basal length. Accordingly I selected the anterior edge of the auditory canal as the posterior point and the gnathion as the anterior point, calling this the audito-basal length.
3. The length of lower tooth row.
4. The zygomatic width (greatest width outside zygomata).
5. The length of upper tooth row.
6. The greatest width of orbit.
7. The mastoid width (greatest width between mastoid prominences).
8. Length of nasal bones.
9. The length of antler along outer curve.

The probable error is also given in each case for the mean, the standard deviation, and the coefficient of variability.

A summary of all these measurements is given below in the form of a table, the measurements appearing in the order of their uniformity, those having the smallest coefficient of variability (C. V.) appearing first.

Under each measurement appears:

1. The number of individuals upon which the calculation is based.
2. The actual mean size of the whole series.
3. The absolute maximum size.
4. The absolute minimum size.
5. Measurement of the type of *borealis* in Museum of Comparative Zoology.
6. The standard deviation, or index of variability (see Davenport, Statistical Methods, John Wiley & Son, 1899, page 15) which gives the average deviation of all individuals from the mean.
7. The coefficient of variability (see Davenport) wherein the deviations from the mean of all the different individuals are reduced to a concrete number, which renders the different skull measurement directly comparable, one with another. This is the important figure to note, and the only one of special interest in determining the relative value for systematic purposes of the various measurements here studied.

	NUMBER OF INDIVIDUALS	MEAN SIZE	MAXIMUM SIZE	MINIMUM SIZE	SIZE OF THE TYPE IN MUS. COMP. ZOOL.	STANDARD DEVIATION, σ	COEFFICIENT OF VARIABILITY, C. V.
Palatal length.....	92 {	17.6 ±0.05	19.4	15.5	19.0	0.76 ±0.04	4.318 ±0.21
Audito-basal length.....	91 {	26.65 ±0.08	30.2	23.7	28.5	1.21 ±0.06	4.55 ±0.23
Lower tooth row, length.....	95 {	8.31 ±0.03	9.2	7.1	8.2	0.414 ±0.02	4.97 ±0.24
Zygomatic width.....	96 {	11.76 ±0.04	13.4	10.4	13.4	0.6 ±0.03	5.107 ±0.24
Upper tooth row, length.....	96 {	7.62 ±0.03	8.5	6.0	7.8	0.41 ±0.02	5.39 ±0.26
Orbit width.....	96 {	4.27 ±0.02	4.9	3.8	4.0	0.24 ±0.01	5.6 ±0.27
Mastoid width.....	95 {	9.83 ±0.05	12.0	8.4	10.3	0.696 ±.034	7.102 ±.348
Nasals, length.....	94 {	9.0 ±0.06	10.9	6.1	9.1	0.89 ±0.04	9.9 ±0.5
Antler length of adults.....	95 {	49.8 ±0.47	72.5	38.2	66.0	6.87 ±0.34	13.78 ±0.89
Antler length including 13 juveniles.....	108 {	47.6 ±0.57	72.5	21.0	66.0	8.9 ±0.4	18.66 ±1.41

Note.—All measurements in Cms.

DISCUSSION

As may be seen at a glance, the most reliable skull measurement in this species, perhaps also in the deer family generally, is the palatal length, which shows a coefficient of variability (C. V.) of only 4.318. Next, and very nearly as uniform, is the audito-basal length (explained above) with a C. V. of only 4.55. The lower tooth row is less variable than the upper, but both these and the zygomatic width are substantially of the same value and are all very uniform.

The orbit width (greatest width of orbit) is also a reliable measurement, but when we come to mastoid width, there is a very marked difference. It is possible that this C. V. (7.102) may have been slightly effected by damaged mastoids, although all those skulls which appeared to have been chipped or injured in the mastoid region were thrown out.

The nasal bones are, as might be expected, by far the least valuable character, showing nearly double the variation of the palatal length. The antler length is included merely to give an idea of the size of the individuals, and naturally shows a very great range of variation. With the 13 juveniles included (these were not included in any of the other measurements) the antler length is of course still more variable.

The value, if value there is, in this study of a series of deer skulls, lies in the fact that all specimens come from a fairly well restricted locality, and that they were all measured by myself in the same way and with the same instruments. I wish that the number of specimens could have been still greater, but as it is, it appears large enough to give a fairly reliable answer to the question of the variability of the several measurements in adult males of the northern Virginia deer. It also gives a correct idea of the extremes of size which we may expect to find in this race.

NOTES ON THE BREEDING HABITS OF CAPTIVE DEERMICE

BY ERNEST THOMPSON SETON

At Cos Cob, Connecticut, on August 22, 1905, I caught a female deermouse (*Peromyscus leucopus noveboracensis*), and put her in a large cage on my study table, so as to observe her continually. On September 15, she was found to have a nest of young—three in number and apparently newly born; therefore gestation was at least 23 days. The house mouse is said to carry for 21 days. My notes are as follows:

October 7. The young mice are three weeks old, but already half grown and very active. They are of a lead color, blended into dull whitish below. One has a weak hind leg; this one often dances; that is, whirls around and around. I once counted 12 turns right to left, then changing he made 11 turns left to right, then a dozen the other way, then a lot so fast I could not count them. This one is evidently troubled with a nervous disease, but one of the stronger ones also whirls at times. A sudden fright sometimes makes them whirl. The sickly one died when five weeks old.

October 27. The young deermice in the cage are now 42 days old and two-thirds grown. One shows a general tinge of brown on flanks and hams. The other is clearly moulted. Along each flank is a line of long unmoulted hair, on the back it is short, sleek and blue.

April 18, 1906. On my return home, after an all winter's absence, I find the old deermouse and one young one remaining. The young one, a female, is now of the same fawn color and white as the mother, but though seven months old is not quite so large, which is doubtless an individual peculiarity. They are active chiefly at night. (But two which I had later commonly came out of the nest at noon to sit for a time in the sun, which fell on their cage. This habit I have also seen in the wild ones.)

April 27. To-day for the first time I heard the deermice squeak and twitter; they seem to be quarrelling in the nest. On May 4 I put a male deermouse into the cage, and, a few days later, a second one.

May 14. The old deermouse female has ceaselessly persecuted the smaller male. To-day he got out and escaped up the chimney, leaving the older male with the two females. The little female showed signs of heat to-day and yesterday, following the old male, sniffing at his rear and nibbling his legs. To-day I gave them a convenient nesting box in the cage. The young female was wildly excited, rushing in and out, preparing a nest. The old male is heard drumming frequently.

Twice I saw him in the act; it is done with one front paw striking down on any near object, so fast that one sees a mere haze of paws for the half second that it lasts. (Later I had a male that drummed a little with his tail.) The little female made a hammering as she scratched herself with a hind foot; but I have not yet seen a female make the drumming. (Later, I kept two females for some weeks, and never once heard them drum.)

These mice often squeak shrilly while fighting with each other. (Later I noted one that gave off a succession of squeaks when caught in a trap.) These observations on the voice are of interest since M. A. Walton, who first recorded the drumming of these mice, says they are

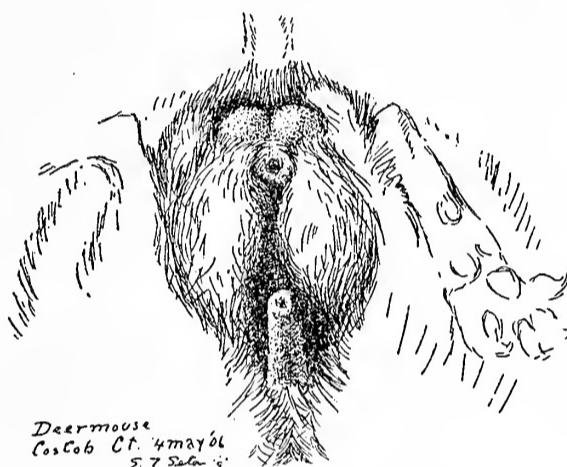


FIG. 1. EXTERNAL GENITALS OF *PEROMYSCUS LEUCOPUS NOVEBORACENSIS*.
MALE.

One and one-half times natural size.

“completely dumb.” It is always dangerous to say that an animal with vocal organs is dumb. In this case, the voice may be so high pitched that only very young, or very sharp ears can hear it.

June 4. To-day one of the mice, the younger female, is obviously near bringing forth young.

June 9. The young mice, 3 in number, were born either yesterday or the day before, so that gestation apparently is 23 days. One of them, measured June 10, was in body $1\frac{7}{16}$ inches long, tail $\frac{7}{16}$ inches. When it was left at the door, the mother nosed it, whiskered it, then carried it back to the nest. When they were 11 days old, I chanced to disturb the mother mouse. She ran out with two of the young attached to her inguinal teats. Although she ran fast, turned, twisted, climbed the bars, carried stuff to the nest and rebuilt it, they hung on, bumping along with every inequality. Later I saw her remove one of

them by force and carry it in her mouth to the nest. (I have also seen them in the woods, carrying their young both ways.) One young which I measured was, body 2 inches long, tail $1\frac{1}{6}$. It was fully haired, but eyes not open.

This same day, I put the father mouse back in the cage with the family. He at once ensconced himself in the nest, despite the mother, who fought him off a number of times, uttering meanwhile a thin twittering. He did not resist but held up his paws whenever she approached. When I removed most of the nest, he helped the mother to carry it back and pack it around themselves and the young ones.

June 21. The young still have their eyes tight closed (13th day). I examined one out in the sunlight, but saw not the beginning of aper-



FIG. 2. EXTERNAL GENITALS OF *PEROMYSCUS LEUCOPUS NOVEBORACENSIS*.
FEMALE.

One and one-half times natural size.

ture. They are now big and strong, and sometimes wander outside the nest. At once mother, never father, carries them back. Nevertheless, father cuddles them much when in the nest. Often they hang onto the mother's teats, when she comes out. So far it has been always the inguinal teats, never the pectoral, that are so used.

June 23. The young mice have their eyes open to-day (the 15th day). They are now about half the dimensions and a quarter the weight of the mother. They are very active and climb extremely well. I saw the tail of one projecting from the nest and gently lifted him up by it. To my surprise I also lifted his mother to whom he was attached and his two brothers who were attached to her, all by the inguinal teats. On June 26 (18th day) I saw them for the first time running

like old ones and scrambling over the bars of the cage. On July 18 (40 days old), they were completely weaned and nearly full grown.

June 6. To-day saw signs of rut in the old pair of deermice. In thirteen days the female was well advanced in pregnancy. On June 22, the 16th day, she was found with 4 new-born young tight on her teats; 3 on the inguinal, 1 on the pectoral; which may mean that I was wrong about the mating time. On the 16th day after birth, their eyes are fully opened, and they are very active.

These mice are extremely fond of nuts and can quickly get at the meat of a shellbark. But when given choice, they went first for some acorns and finished them, before touching the hickories. They killed and devoured a cicada that was put with them.

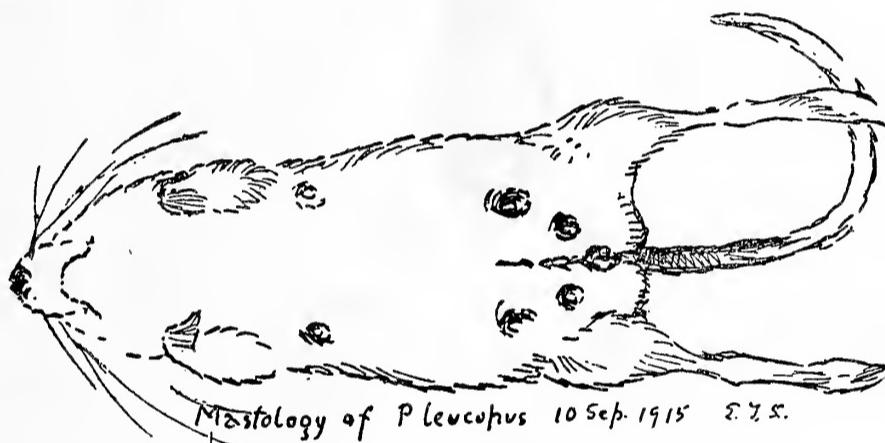


FIG. 3. MAMMÆ OF PEROMYSCUS LEUCOPUS.
Two-thirds natural size.

At another time I had but one deermouse in the cage when a meadow-mouse (*Microtus*) arrived and was put in to keep him company. I watched closely fearing that they might fight, in which case I expected it would be necessary to rescue the deermouse. But it turned out otherwise.

The deermouse made one or two darts of bewildering quickness, and the meadowmouse beat a retreat. Within two days they were good friends, and made a joint nest in a curl of birch bark. Though much more intelligent than his friend, the deermouse had made little effort to escape from the cage, but the meadowmouse spent most of his time gnawing at the wooden parts of the frame. In particular he worked at the upper part where he had to cling and gnaw at the same time.

After a fortnight I set both at liberty in the woods. The meadow-mouse kept on running, dodging behind logs and sticks, using every shelter, but still running until it found a hole. The deermouse gave three or four long bounds, got behind a tree, then squatted flat on the leaves. I followed and found him. Again he got out of sight and squatted. This he did as often as I followed, until he had the luck to find a hole. When squatted on the leaves his color so closely matched them, that he was very hard to see.

Greenwich, Connecticut, October 3, 1919. Found a deermouse's nest in the tangle about 18 inches from the ground and against the side of a log. It contained 2 adults, and 2 young ones about two-thirds grown; I should say they were 6 weeks old.

October 5. Found the mother and 4 young in the nest.

October 7. Both adults in the nest to-day and, with them 5 young in gray pelage.

October 8. Last night for the first time it was very cold. Our first touch of frost; this morning the nest was empty.

October 9. Mild once more; 4 young in the nest this morning.

October 10. Dull and warm. The mother and her brood in the nest this morning.

October 11. Mother and young in nest.

October 13. Frost last night, the nest empty. Found a young deermouse drowned in a well 50 feet away.

October 14. One young deermouse in nest to-day.

October 16. Warm night, one old deermouse in nest; one young fished alive out of the well (one drowned there on 13th); a third found wandering alone 40 feet from the nest. Maybe all are of the same brood.

October 17. Sharp frost again last night. The deermouse nest deserted finally.

These observations seem to show first, that both parents take part in caring for the young; which implies that the species is strictly monogamous. Second, that they have more than one nest, and these are suited to different kinds of weather; this habit is known also among squirrels.

As a concluding item, a note from my journal of October, 1904: I found a deermouse's nest among some old carpets in an outhouse. It had an unpleasant smell; when opened it contained three tiny young ones, apparently new-born, dead and dried up, and with these the dead body of the mother at the moment of maternity with another young one. Mere fragments of evidence, but enough to bring a sympathetic tear to the eye of one who knew the mother's pain.

GENERAL NOTES

HOY'S SHREW IN LABRADOR

In a collection of mammals made some twenty years ago by Mr. Jewell D. Sornborger, and later acquired by the Museum of Comparative Zoölogy, Cambridge, is a single specimen (M. C. Z. 13444) of Hoy's shrew (*Microsorex hoyi*), a species not hitherto recorded from Labrador. It was captured in 1898 at the Moravian mission settlement of Hopedale on the northeast coast, and so considerably extends the known range of this boreal species. A careful comparison of the skin with other specimens from Quebec and Alberta does not reveal any notable differences in color or proportions. I am indebted to the Museum authorities for the opportunity of publishing this interesting record.

—Glover M. Allen.

A BAT NEW TO THE JAPANESE FAUNA

On his last expedition to the East in search of new or interesting woody plants for the Arnold Arboretum, Mr. Edward H. Wilson captured a small bat on the island of Yaku (Yakushima) which lies some ninety miles south of Kagoshima on Kiushu, the southernmost of the large Japanese islands. This specimen in alcohol, Mr. Wilson has kindly presented to the Museum of Comparative Zoölogy, to the authorities of which I am indebted for permission to record it here. It proves to be a species of *Murina*, apparently identical with *M. ussuricensis* lately described by Ognew (Annuaire Mus. Zool. de l'Acad. Imp. Sci. St. Pétersbourg, 1913, vol. 18, p. 402, pl. 12). This author bases his description on two specimens from Ussuri-land, eastern Siberia, the first a female captured April 23, 1910, at Dorf Ewseeivka, Kreis Imansky; the second captured August 13, 1913, at Odarka, Chanka Lake. Mr. Wilson's specimen is therefore the third to be recorded, and extends the known range of the species some fifteen degrees of latitude southward. It was captured in February and may therefore have been a migrant from the inhospitable winter climate of Ussuri and northern Manchuria to the warmer islands of southern Japan. The following measurements indicate close agreement in size, nos. 1 and 2 being respectively the first and second of Ognew's specimens, no. 3 the one here recorded:

	1	2	3
Total length (about).....	68.5	73.2	72
Forearm.....	31.2	32	32.6
Tibia.....	15.8	16.4	16.5
Greatest length of cranium.....	16	15.7	16.7

Hitherto *Murina hilgendorfi* Peters was the only species of the genus known from Japan (see Aoki, B., "A hand-list of Japanese and Formosan mammals," Annot. Zool. Japon., 1913, vol. 8, p. 287). It is a considerably larger species (forearm 43 mm.) but with much the same general proportions. Its skull, however, has a low sagittal crest while that of *M. ussuricensis* is smooth.

—Glover M. Allen.

FOOD OF THE RED FOX

On January 21, 1920, I was following a large fox track through the woods, where the animal had been hunting in leisurely fashion. On coming to a high stone wall he had leaped up on it, and there dropped dung. The four pellets were rather small, soft, smooth and of a dull green color, but there was no sign of fruit or hair on the outside. I sent the mass to the Biological Survey for examination, and received the following report: "The pellets were composed of about 90 per cent. mouse fur, mainly of *Microtus pennsylvanicus*. There were a few bones of the mice, one small feather of a bird, probably a chicken, and some skins and seeds of apples. The green color over the outside and to some extent throughout the felted mass is undoubtedly from the stomach contents of the *Microtus*, which would be mainly grass. I should think from the amount of fur, that 10 or a dozen mice were represented in this lot." (Bailey). As there was about two feet of snow on the level one wonders how he got at the mice.

—Ernest Thompson Seton.

Greenwich, Conn.

ACROBATIC SKUNKS

Arthur H. Howell's note on *The Spotted Skunk as an Acrobat* prompts me to write that this performance of standing on the front feet with hind feet up in the air is one that I have seen many times in the big northern skunk (*Mephitis putida*). Among several hundred skunks I found many that never did it, one or two that did it occasionally, and one that did it so much that his name with all the children was 'Johnny-Jump-Up.' It was usually done in a sort of playful threatening. He would stamp with his feet, run forward two or three paces, give a hard stamp with his front feet, and throw his hind quarters straight up in the air, with tail hanging forward and down or to one side. He always seemed to be in a rollicking good humor when he did it. I tried several times to photograph him in the act, but failed.

—Ernest Thompson Seton.

BOBCATS AND WILD TURKEYS

During a visit to northeastern Arkansas in the first week of February, 1920, I was told by several hunters that the high prices commanded by furs were stimulating the trappers to such an extent that bobcats (*Lynx rufus*) were getting scarce, and the immediate result of that was a marked and steady increase of wild turkeys.

—Ernest Thompson Seton.

THE WOOD RAT AS A HARVESTER

In December, 1916, while engaged in securing data for a report on some mineral lands near Magdalena, New Mexico, a small mining town 20 miles west of Socorro, I was surprised at the large shipments of pine nuts that were being sent to market from that station. A few miles west of Magdalena there is a considerable growth of piñon pines that might furnish a large harvest of nuts, but knowing the natural

distaste on the part of the Mexican inhabitants for manual labor between meals, I was puzzled to account for the wagon loads that they were daily bringing to market.

I was told that eight car loads had been sent to the eastern dealers, at that date, and as many more were expected before the end of the season.

Upon inquiring of the Mexicans, as well as the American merchants, I learned that the nuts were all secured from the store houses of the wood rat. Armed with an iron hook, about three feet in length, for removing the top of the nest, the Mexican nut hunter seeks the cactus thickets in the neighborhood of the pines. The nests and storehouses of the wood rat are usually placed in the shelter of the chollo cactus, if any are about, and thus protected are comparatively safe. The dome-shaped collection of sticks, dead cactus, and in fact everything movable within a hundred feet of the nest, is the retaining wall of a store of nuts, of from a quart to five gallons; the man securing in a few moments what he might pick up from the ground, under the pines, in a day's work. I was told that this store would be renewed within a week and the same rat pay rent, perhaps as many as five or six times during the fall and winter.

I think that the storehouses are always separate from the nests, and at times are at quite a distance from nests that are occupied. As I was unable to take any specimens, owing to the short time I was in this section, I am unable to say with certainty just what species of wood rat is found in the locality.

—A. W. Anthony.

MICROTUS TOWNSENDI IN THE CASCADE MOUNTAINS OF OREGON

All the records for the Townsend vole seem to be from the lower river valleys of western Oregon and Washington, and, indeed, the species has seldom been recorded except from localities situated on or close to tidewater. During July, 1919, I secured a series of fifteen specimens at Prospect, Rogue River Valley, Oregon, that are referable to this race, as well as a number of *Microtus mordax*, and one individual that seems to be *Microtus richardsoni arvicolooides*; but the skull of the latter has disappeared and I cannot be certain.

The middle reaches of the Rogue River flow through a dry country with summer temperatures that may reach 110 degrees, and I feel satisfied that this arid territory is an effective barrier to the continuous distribution of most of the forms that are characteristic of the humid coast belt. Prospect is at an elevation of about three thousand feet, and there is a fairly strong infusion of Transition elements in the surrounding country, but there is a pronounced change in the flora of the slightly lower country a couple of miles to the westward, and I believe that its chief tendency is Boreal. *Vulpes*, *Eotomys*, *Eutamias senex* and *Lepus washingtonii klamathensis* are a few of the forms that occur here, and in the small patch of alsike clover that was swarming with the *Microtus*, I took such Canadian species as *Zapus pacificus* and *Neosorex bendirei*. Taking all these points into consideration, it seems likely that the range of *Microtus townsendi* is interrupted between the coast and the mountains. Although there are no high mountains in the immediate vicinity of Prospect, the region rises in a remarkably even slope to the lofty peaks of the Cascades, and this vole may be expected to occur in areas that are subject to similar climatic influences on the western slopes of the Cascades, north as far as the Columbia River gap.

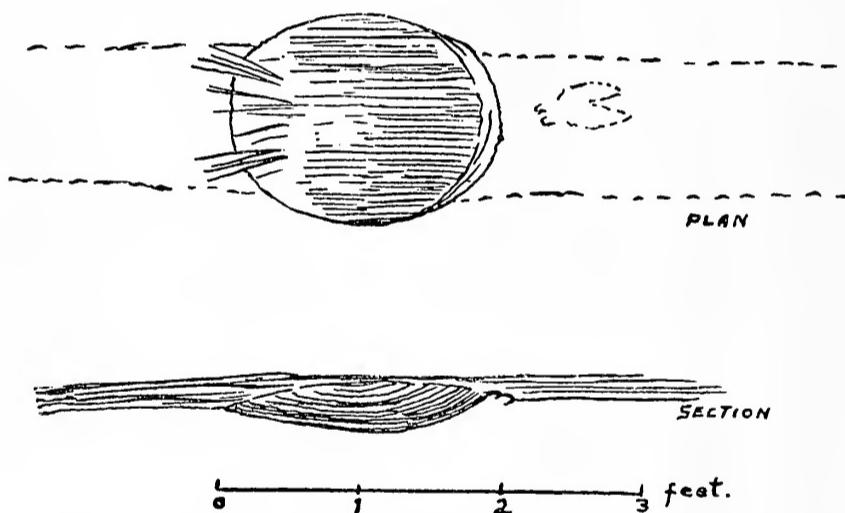
Specimens of *Microtus townsendi* from Prospect differ from coast examples kindly loaned me by the Bureau of Biological Survey, and assumed to be typical, in having the feet and tail darker, and in being of a grayish rather than brownish shade, while the coloration is darker mid-dorsally. The foramen magnum is smaller with less pronounced superior notch, the interparietal is smaller transversely, the molariform teeth project more beyond the alveoli at all ages, the median spread of the nasals is less abrupt, and the antero-superior portion of the zygomatic root of the maxilla is less angular. The material at my disposal indicates that the Prospect animals may be smaller than typical. These differences are mentioned as being of interest when considered in relation to the distribution of the species, but are not deemed sufficiently pronounced to merit subspecific recognition.

—A. Brazier Howell.

Berkeley, California.

DEPRESSIONS FOUND ON MOOSE TRAILS AND THEIR SIGNIFICANCE

During the summers of ten years the writer has travelled extensively in the remote parts of northern Ontario and Quebec where moose are plentiful. In 1919, he had the opportunity of observing moose in a district where the lowlands between the rock hills were of sand, silt, and clay instead of the moss bogs or



Pit made by Moose.

FIG. 1.

muskeg which are so common. Through the forests in this section, the moose trails were more distinct than in the muskeg, and in the moist silt and clay the tracks were sharply defined. During the months of May, June, July, August, and the early part of September nothing unusual was noted along these trails.

On the night of September 21, 1919, while sleeping in a prospector's cabin, the writer was awakened by a moose-call. The sound seemed to come from a point

near the creek about 200 feet away. Noises made by twigs breaking, bushes rustling and a variety of grunting noises continued to come from that locality for about half an hour. Then two moose were heard to walk close by the cabin and away toward the north. Next morning, upon going to the creek, a moose trail was followed to the place from which the noises of the night had come, and in the middle of the trail, surrounded by a small area of trampled bushes was a peculiar, freshly-formed, pit. This pit is the feature of special interest described in this statement.

The soil on the trail was of clayey silt softened by the rains of the previous days. The pit was elliptical with diameters of about 2 feet and 18 inches; it was 2 inches deep near the center. Moose tracks were abundant in this vicinity and there were several at one side of the pit which showed that the hoofs had slipped in the mud. The inside of the pit was covered with fine parallel striations, and a few moose hairs occurred on its surface. From a study of the pit it was possible to determine that it had not been made by pawing or rolling but that it had been made by the body of the moose sliding in the mud.

Subsequently, the main moose trail which led north from this point was followed; and at a distance of 10 chains a similar pit was found. The next day two other pits of similar character were observed on moose trails, one being in sand and not distinctly marked as were those in clay.

A local hunter was shown some of these pits and asked what they meant. He supposed that they indicated the site of a combat between bull moose. He stated that he had never observed them at any other time of the year than the late fall. He had not previously noted the striated surface of the pits nor the lack of a second one which would presumably be formed if two animals opposed their horns and pushed.

The writer advances the suggestion that these depressions are formed by moose during copulation. Such a structure would be the obvious result if the animals follow the procedure of cats, the female lying down.

—T. L. Tanton.

Ottawa, Canada.

BREEDING OF THE BRAZILIAN TAPIR

The following breeding record of a pair of Brazilian tapirs (*Tapirus terrestris*) in the collection of the National Zoological Park covers a period of 16 years. The male was obtained at Manaos, Brazil, in the spring of 1899, by Commander C. C. Todd, U. S. N., while in command of the U. S. Gunboat Wilmington during her voyage up the Amazon. The female, which was bred and reared in the botanical gardens at Demerara, arrived at the Park in August, 1901. The male was about one year old, and the female probably between 3 and 5 years, when received.

The first birth from the pair occurred May 15, 1903, and the young came rather regularly thereafter, the record being as follows:

May 15, 1903; male;	period of gestation, uncertain
November 7, 1904; female;	" " " "
June 27, 1906; male;	" " " 405 days
October 13, 1907; male;	" " " 395 "
February 28, 1909; male;	" " " 401 "
July 11, 1911; female;	" " " 392 "
May 23, 1913; male;	" " " 403 "
August 4, 1915; male;	" " " 396 "
February 22, 1918; female;	" " " 404 "

While there is, in two or three cases, a little uncertainty as to the exact time of breeding, 400 days may safely be taken as the average period of gestation. For the single birth from another pair the period was 401 days.

The death of the male, September 17, 1917, closed the record, though it is probable that the female would have bred further, as she is still in vigorous health.

Two of the young tapirs died, one from enteritis and the other as result of an accident. The rest, when from 9 months to 2 years old, were disposed of in exchange for other animals.

—A. B. Baker.

THE FUR SITUATION

The largest sale of furs which ever occurred took place in St. Louis during the first half of February, 1920. In the course of 12 days peltries to the value of \$27,000,000 were disposed of. A week or two later a similar auction sale of somewhat less extent occurred in New York. Next May a third auction sale of furs will be held in Montreal. Thus it appears that we have in North America three distinct corporations handling furs extensively.

The center of the world's fur trade is now beyond question located in America. Only a few years ago London was the main fur center of the world. Leipzig and Moscow were its satellites. Prior to 1914 the bulk of American raw furs were transported across the Atlantic, sold, dressed, dyed, and resold in London and other European centers. Many of them were finally brought back to this country to be worn out. Now all this is changed. The raw furs produced in America and many brought from other parts of the world are sold at American auctions to American dealers, and dressed, dyed and manufactured in American establishments for American and foreign trade.

While St. Louis is the greatest sales center, New York City is the center of fur dressing, dyeing and manufacturing. In greater New York there are approximately 18,000 people engaged in the various branches of the fur industry. About 500 of these are dealers. The capital invested there has been estimated to be about \$200,000,000. The number of dressing and dyeing establishments in New York in 1918 was about 60. They handled in that year a total of more than 39,000,000 skins.

A National conference on the fur industry and wild life protection in Canada was held at the Windsor Hotel, Montreal, February 19 and 20, 1920, under the auspices of the Commission of Conservation and the Advisory Board on Wild Life Protection. The program consisted of papers and addresses followed by discussion on the following subjects:

The Fur Industry Convention and what it may accomplish.

Our fur bearing animals: their economic significance and future.

Problems of fur production, including the care and management of foxes, nutritional problems, parasites, diseases, fox raising as a commercial proposition, raising and feeding foxes, and fur farming in Quebec.

Registration of silver foxes.

Rearing fur bearers other than silver foxes.

Fur statistics relating especially to the annual fur output of the Province of Quebec.

Marketing furs, including improvements of methods of marketing, trade names of furs, and a Canadian auction fur sale.

Game laws and administration, including the sale of game, game protective associations, and a discussion of game laws from the standpoint of the legislator, the trader, the trapper, the fur dealer, and the fur manufacturer.

While this meeting was attended mainly by Canadians a number of Americans were present also. The papers and subsequent discussion disclosed the fact that Canadians evidently feel that the fur resources of their country are of prime importance. The annual returns from furs outweigh those from game.

—*N. Dearborn.*

A SUPPLEMENTARY NOTE ON CLEANING SKULLS

Experience at the Museum of Vertebrate Zoology indicates that after placing fresh skulls in a seventy per cent solution of alcohol it is better not to take them out again until one is ready to clean them. Be sure that the alcohol used has not been denatured with formalin, or the skulls will be very much harder to clean. Instead of cooking the skulls in an open pan, try cooking them in a covered, double boiler for a considerably longer period.

—*A. Brazier Howell.*

RECENT LITERATURE

Hinton, Martin A. C. REPORT ON THE HOUSE RATS OF INDIA, BURMA, AND CEYLON. Journ. Bombay Nat. Hist. Soc., vol. 26, pp. 59-88, December 20, 1918, and pp. 384-416, May 20, 1919.

After studying the very large series of house rats obtained by the Mammal Survey of India together with the Indian material in the British Museum Mr. Hinton concludes that of the 21 known Indian, Burmese and Ceylonese forms no less than 17 (12 new) are subspecies of *Rattus rattus*. His general observations on these subspecies are of unusual interest. "Turning now to India," he says (pp. 65-68) "the rats listed in the Survey Reports as '*rufescens*,' or '*rufescens* var.', afford us with problems of considerable complexity. In the first place, although I am unable to find any character in the dentition, skull, or external parts, to distinguish any of them satisfactorily from *R. rattus*, the range of variation is enormous. Indian skulls with well worn teeth have the condylo-basal length ranging between 34 and 44 mm. The fur may be long, soft, dense and without spines; or it may be short, thin, and harsh, with numerous spiny bristles. The dorsal colour varies between bright rufous, or warm olivaceous tints on the one hand, to dull tawny, or cold mixtures of black and grey on the other. The underparts may be pure white or pale lemon; or they may be slaty, with or without a rusty tinge or bloom. The hands and feet may be white or yellowish above, with or without dusky markings; or they may be wholly blackish brown in colour. The mammary formula may be 2-3=10 or 3-3=12. Every intermediate stage between the extremes indicated may be found in the collections before me. Nevertheless, much of this variation has a definite geographical value; and where long series are available from one locality or district, the rats are usually found to conform closely to one or more definite local types. It is therefore possible to define a considerable number of local races or subspecies.

The members of the *rattus* group seem to afford an exception to the rule, so general for wild mammals, that not more than one subspecies of a given species, or not more than one of two or more very closely allied species can inhabit a given locality. But these rats are capable of playing many parts in warm countries; thus we find them following a free life in fields and hedgerows, far from houses, or high up among the branches of trees in forests; or they may lead a purely parasitic existence in human habitations or shelters. It is a poor sort of locality which refuses at least two "niches in nature" for *rattus*; and the semi-domesticated stocks, at all events, of this species have frequent opportunities for prospecting and touring conferred upon them by railways, wheeled carriages, and shipping.

Like other murines, this species shows, within certain limits, an almost startling plasticity. Its structure responds readily to the demands of purely local requirements. If necessary colour or the quality of the coat are modified; a change in diet induces modifications in the development or the "set" of the muscles of mastication; and these in turn mould the skull, or lead to the lengthening or shortening of the tooth-rows.

Considerations such as those mentioned in the preceding paragraphs lead us to realize the hopelessness of attempting to disentangle the history of the rats in large towns or ports like Calcutta or Bombay. In such places the rat population

is a motley horde, representing the progeny of truly native rats crossed with the descendants of old wanderers and with newcomers not only from the neighbouring hinterland but from all parts of the world. It is therefore only in the more remote parts of the country that we can reasonably expect some measure of success to crown such efforts.

Mr. Wroughton has already brought before the Society (*J. B. N. H. S.*, Vol. XXIII, p. 474) the view that the white bellied forms of *R. rattus* in India and Burma represent the primitive wild form of the species; and that the dark bellied types are parasites, the darkening of the underparts, no less than the darkening of the back, being the outward indication of domesticity or parasitism. In support of this view, one may point to the general similarity of the Indian white bellied forms to the wild race, *R. r. frugivorus*, of the Mediterranean region; to their wide distribution, both in the mountains and in the plains, in India and Burma; and to the wild life which many of them lead in the jungles. Further on investigating these white bellied rats in detail, we find that they behave very much as do normal wild mammals as regards geographical variation and that it is therefore possible and comparatively easy to arrange them in geographical races or subspecies.

With regard to the dark bellied rats the case is different. They are largely restricted to districts possessing substantial houses; they are more frequently caught within doors and far less frequently in the open. Close investigation of their structure leads to nothing but confusion; the variation is largely individual or colonial, and scarcely at all geographical. In some districts, as in Kumaon, such rats seem to have little or no connection with the white bellied forms; in other places, they differ from their white bellied companions merely in colour and to a trifling extent in skull—the cranial differences being readily susceptible of a physiological explanation,; finally, in still other districts, the difference is purely one of colour and even that sometimes breaks down. One concludes from this that the dark bellied rats are of diverse origin; some seem to have been produced, in the localities where they are now found, from the local white bellied race; others have found their way to their present habitations from other more or less remote districts of the country, or even from abroad; and lastly, many are doubtless to be regarded as the mixed descendants of both native and imported stocks."

It will readily be seen that the interrelationships of these rats presents a complicated problem and one which is rarely met with among mammals. Of particular importance is Mr. Hinton's suggestion that, in the *Rattus rattus* group, distinct subspecies are probably being developed in different "niches in nature" at single localities. While the facts now at hand may not be sufficient to prove the occurrence of such development among the rats under discussion they clearly indicate the possibility that it is taking place. Something of the kind must be assumed as the first step in establishing lines of "local adaptive radiation," a process which appears to have exercised great if not dominating influence throughout the evolutionary history of all mammals. At present, however, this process is known from its later or finished results only; its earlier stages have not been demonstrated. Detailed observations on the living house rats of India in their natural surroundings are therefore much to be desired. A clear understanding of the early stages of adaptive radiation might be one of the results.

—G. S. Miller.

Cabrera, Angel. *GENERA MAMMALIUM. MONOTREMATA, MARSUPIALIA.* Madrid, Museo Nacional de Ciencias Naturales, pp. 1-177, pls. 1-19, many figures in color. 1919 (Received in Washington October 6).

The appearance of the first part of Cabrera's *Genera Mammalium* marks the beginning of a work which, if completed in the same manner that it has been begun, will be the most important publication on mammals since Trouessart issued his *Catalogus* twenty years ago. The author has had long experience in the analytic study of his subject; he now shows his ability in synthesis. Those who are acquainted with the literature of mammals will appreciate the degree to which this combination of qualities is rare.

"The plan which I have followed," Mr. Cabrera writes in his preface (freely translated), "is the same as that of the well known *Genera Insectorum* of Wytsman, a plan which has appeared to me the most satisfactory on account of its conciseness and clearness. In imitation of the procedure followed in this monument of entomological literature I omit keys to the species, limiting myself to enumerating these alphabetically and distinguishing them by serial numbers; the same is done under each species for the subspecies, which are designated by Greek letters. I recognize that my book is, rather than the result of personal investigation, a simple work of compilation. If there is anything good or useful in it this will be the material which I have taken from others. My task, more mechanical than anything else, has merely been to assemble this material. The errors which may have slipped in will, I hope, be pardoned by the reader in view of the abnormal conditions which humanity is subjected to at this time and which have made it difficult to procure certain references and details that would have contributed toward greater completeness."

The text is entirely in Spanish. It consists of a series of diagnoses and keys (strictly dichotomous and clearly expressed; I have not yet had the opportunity to test them with specimens), covering all groups from order to subgenus. Synonyms and distributions are given under genera, subgenera, species and subspecies; a bibliographical paragraph is included in the account of each family. Other subjects formally treated are: history (under families), habits (under families), reproduction (under families), paleontology (under families), types of recognized genera and subgenera, and derivation of the accepted generic and subgeneric names. Mr. Cabrera's work has been done with great care, thoroughness, and skill, so that errors, typographical and other, are conspicuously infrequent. The omission may be noted of *Leucodidelphis* (von Ihering, *Revista Mus. Paulista*, vol. 9, p. 347, 1914) under the genus *Didelphis* and of the very important *Eodelphis* (Matthew, *Bull. Amer. Mus. Nat. Hist.*, vol. 35, p. 477, July 24, 1916) in the account of the paleontology of the family *Didelphidae*. Three new genera are described: *Minuania* (type, *Didelphis dimidiata* Wagner), *Holothylax* (type, *Didelphis opossum* Linnæus), and *Amperta* (type *Chætocercus cristicauda* Krefft). The plates were drawn by the author. While the figures of skulls and teeth seem to be entirely satisfactory the reproduction of the colored drawings leaves much to be desired; obviously in most instances justice to the originals has not been done.

There are three features in the plan of the book which might be altered to the advantage of future parts. The scale of reduction or enlargement could be indicated by a symbol placed after the number of each figure on the plates, a table

of contents could be added in which the classification adopted would be shown in synoptic form, and the extinct members of the group could be given their proper place in the general text if not in the keys. At present the fossils are cursorily mentioned in the paragraph headed Paleontology as part of the general account of each family. Hence such fossils as represent families of their own, like *Diprotodon* or *Nototherium*, entirely escape notice. Furthermore, such names of fossils as do occur in the text are not included in the index and are not accompanied by references. This failure to treat the extinct forms in the same manner as those now living is a surprise in view of the comprehensive title *Genera Mammalium*. It is the only serious adverse criticism to which the book appears to be open. But unfortunately it too often happens at present that mammals preserved in rock are treated and thought of as essentially different from those preserved with arsenic or alcohol.

As a book the volume has the attractive character which comes from well selected type, well arranged paragraphs, and well margined pages. It reflects credit on the National Museum of Spain and on the "Junta para ampliación de estudios e investigaciones científicas" under whose auspices it is published.

—G. S. Miller.

Lönnberg, Einar. REMARKS ON SOME SOUTH AMERICAN CANIDÆ. *Arkiv för Zoologi*, Stockholm, vol. 12, no. 13, pp. 1-18, figs. 1-4. Printed September 3, 1919.

Dr. Lönnberg describes and figures the skull of *Pseudalopex lycoides* (Philippi), basing his account on three specimens collected on the eastern pampas of Tierra del Fuego by Ohlin during Nordenskjöld's expedition of 1895-6. While resembling the skull of *P. magellanicus* from the neighboring mainland in form it is decidedly larger, agreeing with that of the *P. peruanus* (Nordenskjöld) found in a cave near Tirapata on the Peruvian plateau. The Peruvian animal was a contemporary of *Onohippidium*, *Scleridotherium* and other extinct mammals. Apparently it has survived with little or no change on Tierra del Fuego while another species has replaced it on the continent. Such a history would parallel that of microtine rodents now inhabiting Guernsey and the Orkney Islands.

The skull of a domestic dog, probably pure bred, obtained from a party of Yaghan Indians on Tierra del Fuego is also described and figured. It shows no resemblances to any of the known native South American Canidæ, but essentially agrees with the pre-Columbian dogs of Peru. In discussing the characters of this specimen Doctor Lönnberg remarks: "That the so-called domesticated dogs are of polyphyletic origin is nowadays generally admitted". Prevalent though this belief may be it probably rests on no secure basis of facts. Superficial resemblances, in general form, in color, and in quality of fur, to jackals, coyotes, foxes and other wild members of the family may not infrequently be seen in domestic dogs. But in all the specimens that I have examined, representing very diversified breeds, the skull and teeth remain fundamentally true to the type which in wild canids is peculiar to the northern wolves. This type, particularly as regards the cheekteeth, does not represent a primitive condition which might be expected to occur in various members of the family without having any special significance. On the contrary, in respect to the development of a combined cutting and crushing type of carnassials and molars it is the most

highly specialized now in existence. It is, as I have said, not known outside of the restricted subgenus or genus *Canis*. Dogs which were certainly not carried by modern Europeans accompany native man in many parts of the world, Africa, Malaya, Australia and South America, for instance, where no true *Canis* is known to occur now or to have occurred in the past, and all of them apparently retain these generic or subgeneric characters uncontaminated by those of their local relatives with which they have been brought in contact. The best explanation of all these conditions seems to be that dogs were originally domesticated somewhere within the northern area inhabited by true *Canis*, and that they were subsequently taken by man to most of the regions into which he has penetrated. Wherever dogs and wild *Canis* in the restricted sense occur together crossing may take place, and by this process many, possibly all, local forms of the wolf have perhaps contributed to the peculiarities of domestic races. At present, however, there seems to be no satisfactory evidence of polyphyletic origin of any other kind.

—G. S. Miller.

Neuville, H. DE L'EXTINCTION DU MAMMOUTH. *L'Anthropologie*, Paris, vol. 29, pp. 193-212, figs. 1-3. July, 1919.

Few ideas regarding the natural history of mammals are more generally accepted than the belief that the Siberian mammoth was specialized to withstand the hardships of life in a cold climate. As a result of histological study of the skin of two specimens in the Paris Museum Mr. Neuville, however, comes to the conclusion that, far from being fitted to bear extreme cold, the mammoth disappeared mainly because the peculiarities of its integument prevented this necessary adaptation. The skin was covered with dense fur. But the power of fur to resist cold and dampness depends on the presence of the oily substance secreted by the sebaceous glands, and these glands, as they now are in the living elephants, were absent. Snow, sleet and rain could penetrate such fur to the base and "transform it into a veritable mantle of ice." Other peculiarities of the Siberian mammoth which placed the animal at a disadvantage were the great size and unserviceable form of the tusks, the absence of a protective horny thickening of the epidermis, such as occurs in the living elephants, and the tendency of the soles, especially of the hind feet, to throw out horny excrescences which resembled those occasionally seen in menagerie elephants and which must have seriously impeded locomotion. Mammoths probably flourished in Siberia at a time when the forests extended to and beyond the Arctic coast. Their physical limitations were such that they were unable to adapt themselves to the climatic changes which brought on the recession of the forests and the establishment of tundra conditions. With the development of these conditions they therefore gradually became extinct.

Mr. Neuville discusses many subjects that are of general interest: the use of the tusks in the living elephants, the establishment of the thickened horny epidermal layer of the skin through an adaptive process which was probably at first pathological ("the skin of the adult elephant forms a vast corneous papilloma"), the function of sebum and sweat, individual variation in the number of toe nails in elephants, the variable size attained by adult Siberian mammoths, former ideas regarding the causes of extinction.

While it seems probable that the factors enumerated had much to do with the final disappearance of the Siberian mammoth it must be remembered that this disappearance was only one phase of the general elimination of proboscidians that took place during the Pleistocene. At about the beginning of this epoch these mammals probably occupied essentially the whole of the continental area of both hemispheres. At its close they had disappeared in America and had become restricted in the Old World to the regions now inhabited by the Indian and African elephants. Throughout the world the group was dying from old age as so many groups of vertebrates had died before. At such a time conditions might undoubtedly prove fatal which would cause no injury to a younger more vigorous stock.

—G. S. Miller.

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CORRESPONDENCE

FOOD STORED BY THE BEAN MOUSE

To the Editor of the Journal of Mammalogy:

I read with great interest the article by Mr. Vernon Bailey in the February issue of the Journal on the Identity of the Bean Mouse. In regard to a statement in the third paragraph of that article perhaps it would be well to make here a slight correction. It was stated that "They are large, fleshy beans produced on underground shoots of a trifoliate bean vine, *Falcata comosa*."

Now as a matter of fact the large beans are not produced on underground shoots. They are produced underground on the extremities of branches which are above ground, running along the surface of the ground. These lower branches of the bean plant start out from the base of the main stem of the plant and run along the surface, making a perfect network of branches lying upon the surface of the ground under the overgrowth of the leafy branches of the plant which climb upon bushes and other vegetation. If the upper, leafy part of one of these bean plants be carefully cut away without disturbing the lower, basal branches they will appear like a lacy network of white threads upon the surface of the ground.

Falcata grows in dense masses of vines over other vegetation in some places, using such vegetation to climb up into the air and light. It has two kinds of branches, the upper, climbing branches, and the basal, prostrate branches which creep along the ground in the shade of the upper growth. These two kinds of branches on the same plant produce two kinds of flowers, from which result two forms of fruits. The upper, leafy branches bear petaliferous, insect-attracting flowers, from which result small brown bean pods from one-fourth inch to one-half inch in length. Within these pods are produced 3, 4, or 5 small mottled beans of $\frac{3}{16}$ to $\frac{5}{16}$ inch in length.

The basal branches, in conformity with their position prostrate on the surface of the ground in the shade of the upper growth are leafless and colorless. Also in conformity with their position away from possible insect visitors their flowers are not petaliferous, but cleistogamous. This self-pollinated flower produces a pod which at once pushes itself into the soft leafmold and loose soil and there develops its single large bean. This ground bean is about the size of the common lima bean, but not so flat. It is of uneven form but thicker, while not so long as the lima bean.

The fruits of both upper and basal branches are equally useful to the species for reproduction, the one being supplementary to the other, and a sort of precautionary provision in case of failure of production of either the one or the other from exigencies of weather or other conditions. Furthermore, it is a curious thing that if the fruits of the basal branches are unable to cover themselves in the soil they will develop in all manner like the fruits of the upper branches, growing small and hard and covered with a thick pod instead of the thin membranaceous covering which develops when it succeeds in burying itself in the soil. Likewise if the basal branches are exposed to the light they do not differ from the upper branches in color.

Melvin R. Gilmore.

Bismarck, North Dakota,
March 9, 1920.

A PLEA FOR MORE CONCISE TECHNICAL PAPERS

To the Editor of the Journal:

Now that so many excellent suggestions and criticisms anent the standardizing of observations, using common sense in regard to vernacular names, and kindred topics, are appearing in the Journal, the time seems propitious for calling attention to another matter, and that is the lack of system often to be noted in technical work.

For a long time, when one had occasion to name a new form, brevity seemed to be the height of style, and the rule was for an original description to consist of about a dozen lines. Little more than the designation of a type was attempted, with the result that if one wished to learn the ways in which the new form differed from its close relatives, he was obliged to work this out for himself—if he had the material to do so. Almost anything is better than such fragmentary information. Now, however, the pendulum of style seems to be swinging to the other extreme, and one frequently encounters comparatively unimportant facts and theories of a systematic nature that are clothed with a wealth of detail worthy of more important subjects. Studies that are of a more pretentious character are often buried beneath a perfect avalanche of detail and ultra-scientific language that confuses even the experienced systematist. Why is this necessary? Is it a subconscious effort on the part of the author to impress the reader with his scientific weight? Any zoologist can awe the layman with nomenclatural camouflage, but the more advanced student is impressed only by the annoyance of having to wade through page after page of minutiae while searching for something of real use to him. Perhaps this is only a manifestation of one's enthusiasm and a tendency to be carried away by one's subject, but the fact remains that continual watchfulness and care are necessary in order properly to correlate the unimportant with the important matters, and not overemphasize the former. If due attention is given to such points, not only will the systematic work of others be facilitated, but much of the derision which the general public aims at the strictly scientific worker, because of his excited strivings over, and voluminous publications on, what may well be expressed by the word "piffle," will be annulled.

A. Brazier Howell.

EDITORIAL COMMENT

A Northern California Section of the American Society of Mammalogists was formed at Berkeley, California, on the evening of February 5, 1920. Mr. Tracy I. Storer informs us that the meeting, which was held at the California Museum of Vertebrate Zoology, was attended by the following: A. K. Fisher, J. Grinnell, A. B. Howell, W. C. Jacobsen, I. M. Johnston, J. E. Law, L. Little, D. D. McLean, J. Mailliard, C. R. Russell, T. I. Storer, H. S. Swarth, and H. G. White. Officers elected for the ensuing year are as follows: President, Joseph Dixon; Vice-President, Joseph Mailliard; Secretary, Tracy I. Storer. Until further notice the Section will meet on the first Thursday of every month at the Museum of Vertebrate Zoology, University of California. Mr. Storer extends an invitation to all members of the Society who may be visiting California to "drop in" at any of the meetings and will be glad if such members can present papers before the section.

Dr. Walter P. Taylor tells us of the organization at Seattle, Washington, on January 7, 1920, of the Pacific Northwest Bird and Mammal Club, with officers as follows: President, Prof. F. S. Hall, University of Washington; Vice-President, J. Hooper Bowles, Tacoma; Secretary and Treasurer, Stanton Warburton, Jr., University of Washington. Thirteen persons were present at the organization meeting and letters were received from others who wished to become charter members. The State Museum at the University of Washington is the official home of the club and the field of operations includes northern Oregon, Washington, British Columbia, and Alaska.

The actual date of publication of the February number of the Journal of Mammalogy was March 2, 1920. The schedule for printing the Journal has now been advanced, so that the date of issue for each number should come early in the regular month of publication, and chances for serious delay will be reduced to a minimum.

It is only natural that many of the members of the Society or readers of the Journal should be more interested in North American mammals than in those of any other country; and it is doubtless true that a large proportion of our pages should at present be devoted to papers on Nearctic forms. It comes as something of a surprise however that members should seriously consider and actually advocate limiting the Journal very largely if not altogether to accounts of our native species. It is highly proper that certain individuals or institutions should specialize on the fauna of a definite region, on a limited part of such fauna, or, if they w^{sh}, on a single family or genus. But for one who does specialize in any of these ways, no matter how intensive his studies, a general knowledge of the group at large would seem to be imperative. A zoologist may confine his real labors, his published results, to a single group or a limited locality but unless his interest and study extend to related forms and regions his work can not be of the highest order. A real interest in the study of mammalogy carries with it an intense desire for information beyond the limits of a county, state, or continent. What of the exact relationships with Old World or Neotropical forms? How about

the extinct species of the same or related groups? How do specialists in other countries, or workers in other fields, handle such and such questions? These are all matters having a vital interest in the work of any specialist, and, if they are ignored, only inferior work can result. It is hard to imagine a student especially interested in any group of mammals or in the fauna of any given region who does not keenly desire to learn all he can of the related forms of the world, living or extinct, or of the technique of other workers who are dealing with them. Such a student is handicapped beyond measure.

The future of the fur-bearing animals looks dark indeed. Virtual extinction of many species is imminent unless prompt and effective means for their protection are devised and enforced. The tremendous popularity of furs of all kinds, the greatly increased number of persons who can or do afford expensive clothing of this kind, and the consequent price on the head of every living fur-bearer, threaten speedily to wipe certain mammals from the face of the earth. It is absolutely certain that many species can withstand the present yearly toll only a short while longer. With raw skunk skins selling in New York City during February up to \$12.50 each wholesale, what chance has the animal for existence as a wild creature?

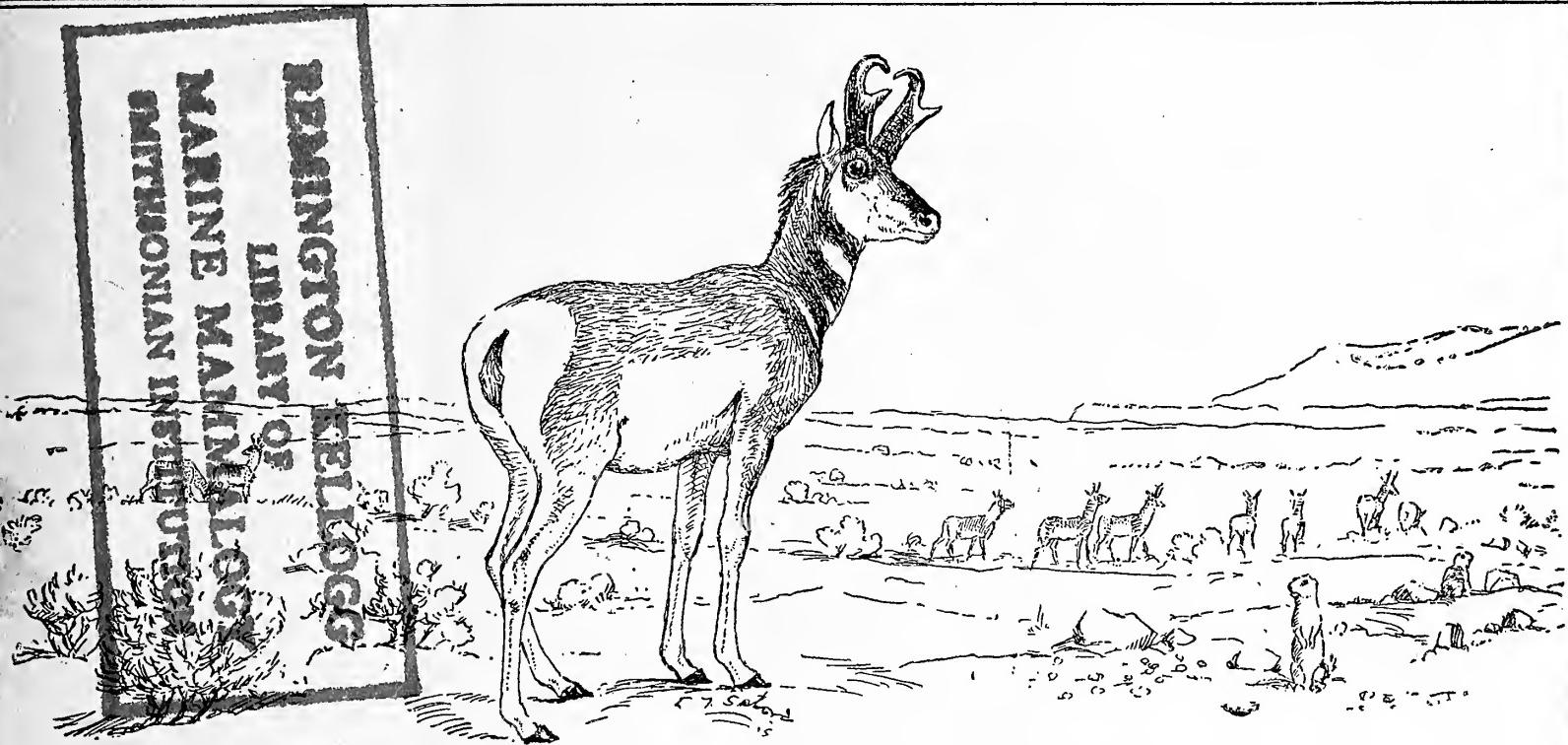
The offerings at the New York raw fur sale in February included over 1,121,000 domestic skins, and a very great many more from foreign countries. Among those listed were 27,000 red fox, 175,000 opossum, 73,000 raccoon, 32,000 wolf (probably including coyote), 239,000 skunk, 4350 badger, 6200 gray fox, 41,500 mink, 7700 marten, 58,000 civet cat, 68,000 ermine, and 9800 wild cat and lynx. The foreign items included, for example, 234,000 Australian opossum, 325,000 squirrel, and 23,500 kangaroo and wallaby skins. This is only one sale in one city, but newspaper reports state that the receipts totaled \$10,600,000.

The fur-bearing animals are a mighty asset to the country, but unless they are carefully guarded by wise legislation and a favorable public sentiment we will soon be without them. It is doubtful if the "fur farms" can furnish enough skins to keep the particular species raised on them in fashionable demand. The main supply must come from wild-killed animals, and few species can long stand the present killing. Those familiar with conditions in the field know only too well that the time of practical extinction for several valuable species is dangerously near at hand. Vernon Bailey, chief field naturalist of the Biological Survey, once estimated that every living badger on a western ranch was worth \$100 to the land-owner as a destroyer of noxious rodents, and the economic value of the skunk and others of the smaller carnivores is well known. But here are the skins of 4350 of these one-hundred-dollar badgers offered in one sale of raw furs, together with the skins of 239,000 grubworm destroying skunks, which will be manufactured into articles to be used a comparatively short time and discarded. It is a question if many of the mammals suffering this depletion from the demands of fashion are not of more permanent value to the country in other ways, and their certain extermination a serious national loss.

—N. H.

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BISON REMAINS FROM NEW ENGLAND

BY GLOVER M. ALLEN

As long ago as 1849, Sir Charles Lyell published the discovery of supposed bison teeth from a bank of glacial clay at Gardiner, Maine. In his book recounting his second visit to the United States, Lyell says (Second visit to the United States, 1849, vol. 1, pp. 43, 44) that the teeth were identified as those of bison by Sir Richard Owen, and that they had been found in association with the shells of marine mollusks identical with recent species. Three of the teeth eventually passed from their original owner, a Mrs. Frederic Allen, to the Bowdoin College Museum, and one was given to the Boston Society of Natural History, in whose possession it still remains. In his memoir on the American bisons Dr. J. A. Allen reviews at some length the history of these teeth and shows (Mem. Mus. Comp. Zoöl., 1876, vol. 4, no. 10, p. 88-91) that Lyell had not himself seen the specimens in place, that their exact position in the clay bank was doubtful, and that Professor Owen disclaimed all responsibility for their identification. After a minute comparison, Doctor Allen was unable to distinguish them in any way from those of the domestic ox, to which he therefore referred them. There seems no reason to question this determination and it appears likely that the teeth had reached their position in the clay bank in some secondary way.

There is thus at the present time no proof that the bison ever occurred within the present limits of New England. Moreover the careful examination of accounts by early travellers as reviewed in Doctor Allen's memoir, indicates that within historic times and probably for a long period anterior to the coming of white men, the bison ranged no farther east than the present west-central Pennsylvania and the southeastern end of Lake Erie in what is now the extreme western corner of New York State.

It is therefore of interest to record the discovery of a fragment of the maxilla with two milk teeth of a bison at Orleans, on Cape Cod, Massachusetts. It is exceedingly fortunate that this discovery was made by a professional geologist, Dr. A. W. Grabau, whose manuscript note made at the time, now some twenty years ago, accompanies the specimen. From this it appears that the specimen was discovered wholly embedded in till about halfway up on a section of a glacial moraine, situated on Town Cove, and about seventy or eighty feet high. The moraine consisted of "till with boulders much rain worn." Associated with the specimen in the till were many fragments of the marine mollusk *Venus*. Doctor Grabau has presented the specimen to the Boston Society of Natural History in whose collection it has since remained. It was brought to my notice during a recent revision of the Society's Pleistocene fossils and was still largely embedded in glacial sand. On carefully cleaning this away, the teeth were seen to be the second and third milk molars (dp^3 , dp^4) of the left side, quite unworn and perfectly preserved, while fragments of an unerupted first permanent molar were also disclosed.

The manner of its occurrence suggests that the bison calf from which the fragment came had either met its end while wandering on the moraine during the formation process or more likely had lived during a previous interglacial stage and its scattered bones had been scraped up by a succeeding glacier during the time of the last or Wisconsin ice-sheet. That the teeth are wholly unbroken indicates that they suffered little from rolling or crushing. Presumably, the animal from which they came must have lived in the so-called Peorian interglacial stage just preceding the last advance of the ice-sheet.

From extensive researches on the mammals of the North American Pleistocene, Dr. O. P. Hay (Smithson. Misc. Coll., 1912, vol. 59, no. 20, p. 13) concludes that of the several species of *Bison* known to have existed in America, all "except *Bison bison* had become extinct before the Wisconsin ice-sheet had retired from its southernmost limit." In view of this conclusion and of the precise agreement of the specimen here recorded, with the corresponding teeth of *Bison bison*, I have referred it to the latter species. The occurrence of a bison in eastern Massachusetts in the latter Pleistocene times not only indicates a former range much farther to the eastward of its known limits within the historic period, but presupposes as well a certain amount of open grasslands. It was perchance an inhabitant of the ancient coastal-plain area, relics of whose fauna and flora are still preserved in isolated colonies along the New England and adjacent coasts.

Since the identification of this important specimen rests solely on the second and third upper milk molars, it may be well to point out some of the details of structure that distinguish these teeth in *Bison bison* from the corresponding teeth of the domestic ox, *Bos taurus*, for at first sight the teeth of the two species are very similar in general appearance. The second milk molar (dp^3), on account of its more complicated structure, is of greater diagnostic value than either of the others. It is (1) slightly longer than in the domestic calf in four out of five specimens examined. (2) At the anterior outer corner there are at the summit of the crown, two very short crests embracing a shallow depression

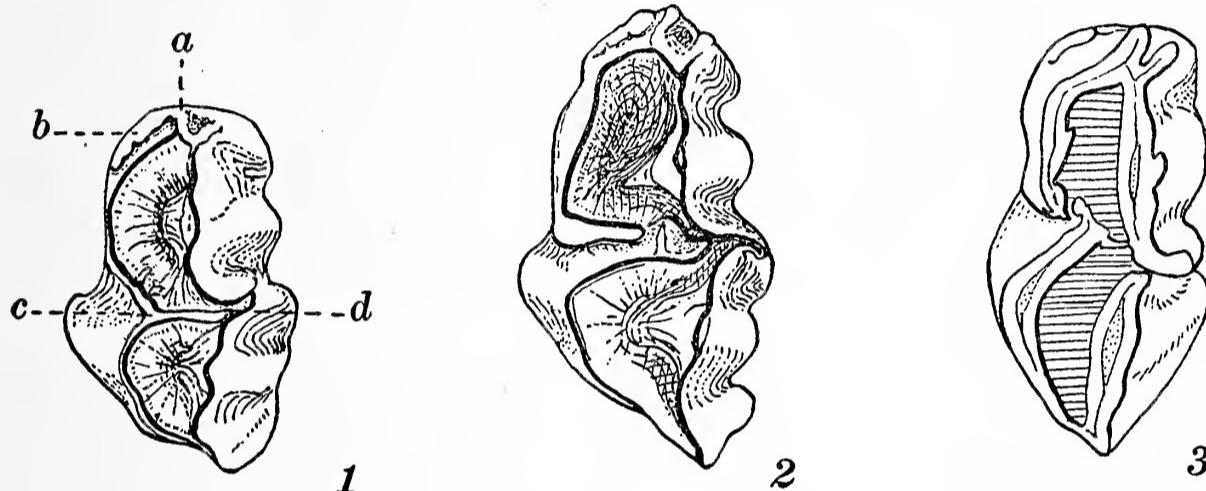


FIG. 1. DOMESTIC CALF, *Bos taurus*

Second upper milk molar (dp^3) of left side, crown view (M. C. Z. 86)

FIG. 2. AMERICAN BISON, *Bison bison*

The same tooth of the Cape Cod specimen, crown view

FIG. 3. AMERICAN BISON, *Bison bison*

Same tooth, slightly worn, in a specimen from Kansas (M. C. Z. 90)

(fig. 1, *a*) in the domestic calf, whereas in the bison (fig. 2) these crests are much more prominent and are separated by a deeper cleft. Both species exhibit variation in the formation of these cusplets. In one domestic calf (M.C.Z. 86) they are practically confluent, without a sign of the dividing cleft; in another the cleft is a mere pit. In *Bison bison* on the contrary they are much better developed and in a slightly worn milk tooth (fig. 3) may even appear as two small lobes. (3) In the domestic calf the antero-internal cingulum cusp (fig. 1, *b*) is much better developed than in the calf bison, forming a narrow and evenly ascending ridge from the base of the tooth to the summit of the crown,

where it fuses with the inner of the two cusplets just described. In the calf bison on the contrary, its inception is much more abrupt from well up on the front side of the tooth and it is usually separated by a deep cleft from the external cusplets. In one specimen (M.C.Z. 112) it is so reduced as to be practically lacking but is represented by two or three minute denticles. (4) A fourth point of distinction is that while in the domestic calf the summit of the anterior crescent is rather evenly confluent with that of the posterior (fig. 1, *c*) in the calf bison the two crescents are usually separated by a distinct notch which in the slightly worn tooth (fig. 3) becomes less evident. Finally (5) the anterior horn of the posterior crescent, when unworn, is seen to extend into the peak of the angle formed by the two external lophs (fig. 1, *d*) whereas in the bison it abuts against the posterior inner wall of the anterior loph, and, as shown in the slightly worn tooth (fig. 3), fuses with it at a short distance below the summit. This feature is also characteristic of the third milk molar (dp^4).

The following measurements of the two posterior milk molars in domestic calves and calves of the American bison bring out the slightly greater size of these teeth in the latter. The Cape Cod bison teeth are the first listed among the bison. It should be added also, that the teeth of bison no. 112 of the table, though as small as those of a domestic calf, in other respects show the characteristic form of the bison teeth to an extreme degree.

Milk teeth of Bos taurus

	COMBINED LENGTH OF CROWNS dp^{3-4}	CROWN OF dp^3	CROWN OF dp^4
	mm.		
M. C. Z. 85	50	26	27
M. C. Z. 86	50	26	27
M. C. Z. 1954.....	51	26.5	28
M. C. Z. 9408.....	50	26	27

Milk teeth of Bison bison

B. S. N. H.....	53.5	28.5	28.5
M. C. Z. 89	53	28.5	29
M. C. Z. 90	52.6	27.7	27.6
M. C. Z. 112	50.5	26	27.2
M. C. Z. 1711.....	52.5	28.2	29

Acknowledgments are due the Museum of Comparative Zoölogy for permission to study and record the excellent series of skulls noted above.

NOTES ON TWO SPECIES OF PHENACOMYS IN OREGON

BY STANLEY G. JEWETT

In the dense forests of the Pacific Northwest, where the sun seldom penetrates the heavy growth of firs and spruces to mother earth, live two species of the most interesting of our small mammals, *Phenacomys longicaudus* in the tree tops, and *Phenacomys albipes* on the moss-covered floor of the forest.

Phenacomys longicaudus

From my knowledge of the state of Oregon it seems to me that the lower Rogue River watershed in Curry County is the center of abundance of these little tree mice. My first visit to this locality was during the fall of 1917. One rainy night while talking to two boys about trapping the various small fur-bearing mammals of the region it occurred to me to ask if they had ever seen "a red mouse that lives in trees." Both boys began at once to tell me of their pets that had recently escaped. Much to my surprise they had been keeping several individuals of this species as pets, and were quite familiar with their habits. I left the ranch next morning at daybreak and while passing through the forest saw numerous nests of the species in fir and spruce trees, ranging from fifteen to eighty feet or more from the ground. Most of the nests were saddled on branches against the bole of the tree, but a few were noted well out on the branches.

Most of the nests are fairly compact round balls about twelve to eighteen inches in diameter, composed of dry twigs and built by the mice occupying them. Other larger and more bulky nests were evidently built by wood rats and later occupied by these mice. Usually they are located in Douglas fir, but several have been noted in Sitka spruce near the coast. Two nests in the barn-yard at the John Adams ranch in Curry County were built about ten feet from the ground in second-growth firs. These nests were as large or larger than a bushel basket and composed of dry fir twigs. The trees stood about twenty-five feet apart and each was occupied by an adult mouse, which proved to be a male and a female. Mr. Adams told me that the nests had been there ten years to his knowledge, and as far as he could remember were the same as when he located his buildings on the ground. He took it for granted they were wood-rat nests, which are very common in that locality. These nests were pierced by numerous tunnels leading to the inner nests of shredded fir leaves.

So far as I have learned the food of this mouse consists entirely of the soft pulp contained in fir and spruce leaves, and the inner bark of the tips of twigs of the same trees. The feeding process is interesting. The mouse sits hunched up and uses its forefeet as hands. Nipping off a twig with the razor-like incisors, he next chooses a leaf, which is drawn through the teeth lengthwise; this process splits the leaf in the exact center and the fleshy part is left in the mouth. The amount of food in each leaf is very small but the animal is a rapid feeder and soon disposes of a lot of leaves. The skin of the mouth and throat of two specimens collected was stained a rich green color. Most occupied nests have a few food twigs on them, this, with the fact that the shredded leaves are used as nest material, is very good evidence that most of the feeding is done in the nest or on its roof.

When the mouse is disturbed in the nest it will sometimes run out on a limb, down the tree head foremost, or will jump to the ground. The two mice occupying the nests at the Adams Ranch, above referred to, both jumped to the ground when I prodded the nests with a pole. They can run rapidly both in the tree and on the ground. At the Lowery Ranch on Rogue River I saw numerous nests in a second growth of Douglas firs back of the house. Inducing a small boy to climb to a likely looking nest I kept careful watch to see if anything left it when he began the ascent. Nothing happened, so I asked him to dissect the nest and throw the material to me. No mouse was seen, but as the nest had been recently occupied I was not satisfied. After careful search I saw the little fellow sitting upright on a dead twig about ten feet above my head. He was sitting hunched up in almost a round ball with the long tail hanging over to one side. How, and when that mouse reached his perch without either of us seeing him will always be a mystery to me. Although I am convinced that these mice colonize to a certain extent I have never heard of two adults occupying the same nest.

The two mice taken at the Adams Ranch were captured alive and placed in a box with part of their nesting material and a few fir twigs for food. As I was leaving the ranch next morning I put box and mice in my pack-sack. The next three days I packed these mice over about sixty miles of rough forest trails only to find them in a dying condition when I reached the coast. They ate quantities of fir twigs and leaves supplied them fresh daily, but as the weather was warm, the continual jostling on my back was too much for them. While handling live specimens I have never had one attempt to bite.

This species was first described by True (Proc. U. S. Nat. Mus., vol. 13, p. 303, 1890) from a specimen found dead on a road near Marshfield, Coos County, Oregon. The present range of the species has not been determined but it has been found over a large part of Curry County; near Eugene, Lane County; at Bonneville, Multnomah County; near Forest Grove in Washington County; and nests possibly of this species at Nehalem in Tillamook County. From their habits it is no wonder the earlier collectors failed to find more of them. How many collectors look in the tree tops for mice?

Phenacomys albipes

This mouse was first described by C. Hart Merriam (Proc. Biol. Soc. Wash., vol. 14, pp. 125-126, July 19, 1901) from a specimen collected in the red-woods forest near Arcata, Humboldt County, California, by Walter K. Fisher during 1899. From that time until May, 1914, Fisher's specimen remained unique. On May 18, 1914, while running a line of oat-meal baited traps near Vida, Lane County, Oregon, I took a fine adult male of *P. albipes* in a wooden mouse trap set among mossy stones along a small stream that flows through a heavy forest of Douglas fir (See Oregon Sportsman, vol. 3, no. 2, p. 37). The forest floor was well covered with sword fern, moss, and a tangle of vine maple. Considerable trapping was done in the same locality but no more specimens were taken, and nothing more learned of the habits of this species. The following month Mr. Vernon Bailey visited Oregon and saw the specimen I had taken. In company with L. J. Goldman, A. C. Shelton and M. E. Peck, all experienced collectors, Mr. Bailey went to Vida and trapped that section thoroughly, but without success as far as *P. albipes* was concerned. During that season the entire McKenzie River region was well worked by members of the Biological Survey and representatives of the Oregon Fish and Game Commission without locating more of the species. Although considerable collecting was carried on west of the Cascades in Oregon during 1915 and 1916 we learned no more of the species until 1917. During September of that year, in company with my wife and several friends I went to Netarts Bay in Tillamook County, Oregon for a few days' vacation. My former experience in that locality showed me that the possibilities were excellent for small mammals so I put eight old mouse traps in my outfit before starting. A day or two after arriving at the beach I set the traps in a salmonberry thicket back of camp. I expected to catch

some *Microtus*, but much to my surprise on visiting the traps next morning one held a specimen of *P. albipes*. During the next few days I took two more of these rare mice, as well as specimens of *Microtus oregonus*, *Peromyscus m. rubidus*, and *Sorex vagrans*, all within twenty-five yards of each other. Along a small stream nearby I took one each of *Spilogale latifrons* and *Neotoma c. fusca*, in the only steel trap I had. As the *Spilogale* was an old male I have often wondered how many *albipes* he had "collected."

From the foregoing it would appear that *Phenacomys albipes* is far from common in the state of Oregon. We know practically nothing of its habits, except that it feeds on the ground in dense forested areas. All those I have taken were trapped with oatmeal for bait.

A NEW GENUS OF RODENTS FROM THE MIDDLE EOCENE

By W. D. MATTHEW

In the collections obtained by the American Museum expeditions of 1903-06 in the Bridger Basin, Wyoming, were several skeletons of rodents. Some, but not all, of these were prepared and described in 1909, in an article by the present writer. During this winter a number of specimens in the Bridger collection have been prepared for study. Among them is a very well preserved rodent skeleton, consisting of the skull, jaws, fore and hind limbs and feet, pelvis and some vertebræ. It appears to belong to "*Paramys*" *delicatissimus* Leidy, 1871, but is clearly not congeneric with the type of *Paramys*, *P. delicatus*. The following generic diagnosis may serve to indicate the principal differences observed:

Reithroparamys gen. nov.

Type, *Paramys delicatissimus* Leidy, from the Bridger formation, Middle Eocene of Wyoming.

Genotype, Am. Mus. No. 12561, skull, jaws, and most of skeleton.

Incisors narrow, deep, laterally compressed, the upper pair slightly grooved on the anterior face. Cheek teeth sciuroid, much as in *Paramys*, and not distinguished by any clearly generic differences. Skull with two parallel raised postorbital crests and a lyrate area behind, instead of the single median crest of *Paramys*. Tympanic bulla of medium size, ossified except towards the posterior margin; no bony meatus. The bulla in *Paramys* is not ossified, nor is it so in any of the nearly related genera or subgenera from the Middle and Upper Eocene, so far as is known. Limbs comparatively long and slender, the hind foot bones long and slim, the fore foot bones relatively small. First metatarsal long but slender, fourth heavier than third, fifth much shorter but comparatively stout.

It is possible that others of the smaller species of *Paramys* would prove to belong to this genus, if better known. *P. copei* Loomis of the Wind River (*Plesiarctomys delicatissimus* of Cope) certainly does not.

The relations of this genus are clearly with *Paramys* and not with *Mysops* or *Sciuravus*, but it presents an interesting new variant on the very limited range of structural divergence found among Eocene rodents.

The characters of the infraorbital region are as in *Paramys*, except that the muscle scar on the inferior surface of the root of the zygoma is less sharply marked off from the anterior surface, which is pitched so as to face more downward, and lacks the pit that in *P. delicatus* intervenes between the infra-orbital foramen and the first upper premolar p.³. The latter tooth is also smaller than in *P. delicatus*. These are individually variable characters in *P. delicatus*, and are not of generic importance.

SOME CALIFORNIAN EXPERIENCES WITH BAT ROOSTS

By A. BRAZIER HOWELL

[Plate 9]

To those who have investigated bats and their habits to even a slight extent, these mammals are of particular interest. From earliest times they have been so little known and understood that they have been regarded with greatest superstition. They hunt during the hours of darkness, spend the day in hiding in out-of-the-way places, and are altogether such retiring, elusive little beasts, that the mammalogist who would become better acquainted with them must be continually on the alert. While riding about the country, one should keep an eye subconsciously active to remark favorable locations, such as large attics with slatted ventilators. If a colony has taken possession of the space between the walls of a house or cornice, there will often be a tell-tale smudge made by the rubbing of small bodies as they emerge from hiding. While fortified with a pocket full of cigars, a collector, by judicious questioning of village constables, blacksmiths, and such public characters will often meet with success; and I have obtained excellent results from advertising in farm papers.

Our bats may be placed for convenience in two arbitrary groups—those which roost singly or a very few together in trees, high cliffs, or similar locations; and those which are in the habit of gathering in

numbers in caves, hollow trees, and old buildings. In the case of the former class, few of us are qualified to talk at great length. Our experiences are limited to a *Myotis* darting from a hole in a stub, a *Pipistrellus* slipping at dusk from a cranny high on a cliff, or perhaps a *Nycteris* hanging motionless in a fruit tree. The expert collector can identify the majority of his chiroptine acquaintances on the wing, but this knowledge cannot be transferred to print, and the opportunities for further enlightenment are so few that only an observer of long experience is qualified to add much of value to the life-histories of the more solitary bats. Even in the case of those species with which I am most familiar, there has been so little complementary work done by others that many of my deductions and theories may have to be revised at a later date. Some of them are here offered tentatively, in the hope that others will be encouraged to delve deeper, as their opportunities permit, into this fascinating branch of investigation.

Most of the better known species of European bats are non-migratory and spend the winters in more or less complete dormancy. In fact, I believe that direct evidence in favor of migration has been obtained in the case of only a very few European forms, and continental naturalists received with considerable surprise the evidence that certain of our boreal species do perform extensive migrations. However, American students have been rather slow to follow this lead, and seem loath to believe that except in southern districts, most of our forms are migratory. Why not? A few have been reported in hibernation, but these reports are very rare and it is more logical to suppose that the majority migrate. I am not prepared to state that none of our California bats hibernate; and, conversely, that as a rule, all migrate; but I do believe that all except the mastiff (*Eumops*) are migratory to some extent, and that species may retire from the more northern boundaries of its range during the coldest weather. Most of our summer bat population is absent during the winter and its place is then taken by forms from farther north or from higher altitudes.

With us, it is the rule that all early flying bats are of the small-eared species, while the large-eared ones, unless some special method of feeding brings them out, fly later. The exception is *Antrozous*, which is often awing ten minutes before it is too dark to shoot; but this bat feeds extensively upon the flightless Jerusalem cricket (*Stenopelmatus*), where these occur and the large ears probably enable it to catch the faint sounds made by the crawling insects. In California, *Eptesicus* is a very early fier, while in the East it appears at late twilight; so the

time of daily appearance evidently varies considerably in different parts of the range of the species.

Several foreign observers have conducted exhaustive experiments—too well known to dwell upon here at much length—which prove that all bats are provided with highly developed tactile nerves in the wing membrane; but that those with very large ears, in addition to face and nose appendages, have these members so extremely sensitive that it is beyond human comprehension. They can dodge threads hung in a dark room and perform other remarkable feats. It is small wonder that these peculiarly endowed creatures should select the darkest hours in which to do their hunting, while their less gifted brethren often appear at sunset. Certain students have claimed that the sense of sight in the large-eared bats is less acute than in those with small ears, and this may usually be so, but certainly not in the case of *Macrotus*, which can see better than any other bats with which I am acquainted. In some genera, the formation of the nose bones indicates an especially keen sense of smell, and such probably often pick insects from leaves and other resting places (as *Plecotus* is known to do).

Many bats have the power partially to suspend animation when asleep. They then become semi-torpid, with decreased temperature and respiration, even on the hottest days; and it takes several moments—longer in cold weather—for them fully to regain their normal activity. This torpidity evidently can be indulged in by the bats at will, and during cooler weather may last for considerable periods. Rain, unless accompanied by very low temperature, has little effect upon bats, but high winds render them almost helpless, and the partial suspension of all bodily functions then stands them in good stead and enables them to bide their time with considerable comfort until the climatic conditions are more propitious. This phenomenon I have called voluntary hibernation, as opposed to the true hibernation in which, because of cold, failure of food supply, or other external influences, an animal becomes completely torpid in spite of itself. The so-called hibernation of most bats evidently belongs to the former class, although there are at least several foreign species which hibernate in the true sense of the word.

Among most forms of bats, the sexes are usually found apart, especially at the season when the young are born. Of the species most typical of the deserts, the males probably spend the entire season in the one zone; but with certain others, as G. M. Allen has pointed out, the males may seek a higher altitude than do the females during the hottest weather. Certain collectors have noted that only females and

young were found in the breeding area, while the males had sought a higher zone.

If a colony of bats is located in an attic, the spots which to us appear most favorable are often unoccupied. When a particular site is once chosen, a little use will fix the bat scent and it will always be selected thereafter. The surface against which the little bodies rest becomes smooth and oily, and often there will be deposits of urine salts a half inch thick. Ectoparasites usually abound, but, as far as I am aware, they are of species which cannot survive upon human hosts. An abandoned roost is rare and it is almost impossible to drive the tenants from a favorite home. Only the most persistent persecution and repeated raids will have any effect, and even if the whole colony is annihilated others will often take possession the following year. A colony of bats is a decided asset, especially in a district where there are many mosquitoes, and it should be broken up only when the annoyance from its presence becomes very great.

The California leaf-nose (*Macrotus californicus*) is a common desert bat and is found only in caves and old mines. Probably it would be nearly as common in the San Diegan coast region if natural caves were not so scarce. The Salton Sea section is an especially fine locality for it, for here there are many caves which the long-departed waves at sea level have tunnelled out of the rocky coast line. Most of these caves are rather shallow and nearly all are tenanted by colonies of this bat—from a score to two-hundred individuals to a colony. They hang singly from the roof by their long legs and are very alert to escape an approaching danger. When one is within thirty feet of them away they go, circling about and dashing out from the entrance to the cave. If one remains quiet a few will return and hang to a horizontal surface, gently fanning half-closed wings and twisting about on one leg with their heads turning in every direction to watch for danger. When alighting they do not catch hold by the thumbs and then turn about head downwards, but "flip up" just as they alight and hang directly by their feet. It is significant that these bats have very long legs, and that the long-legged European *Rhinolophus* also uses this method of alighting. This habit is doubtless a necessity to species that hang directly from a horizontal surface, and this method of roosting probably tends to lengthen the legs. It is perhaps a rule that bats with exceptionally long legs are free hangers; or, in other words, that they hang by the feet without support from any other part of the body.

Although the leaf-nose is a very late flier and I have never heard of it being observed hunting before complete darkness sets in, we found the wings of several diurnal butterflies, as well as parts of moths, beneath their roosts. The sexes have been found together only during the mating season. It is not a species that is strictly migratory, and may not be so at all, for a colony will spend the winter—apparently in a perfectly active state—in a deep cave, the temperature of which never varies greatly. Shallow caves are, however, deserted at the approach of cold weather; and, judging by the seemingly reduced winter population, it is possible that some of the bats at this season may seek a warmer climate.

Some six hundred Yuma bats (*Myotis yumanensis yumanensis*) were found at the one and two-hundred foot levels of the old Senator Mine on the Colorado River. Nearer the surface many were clinging singly to the walls, and these were in a sound sleep, squirming but feebly when plucked off like ripe fruit. Nearby there were a few lively ones, and those in bunches at the deeper levels were all active. The latter were gathered in two knots of a hundred each and one lot of over three hundred, in a compact mass, on the uneven roof of a chamber. When these were approached too closely, the bats swarmed off in every direction, bumping into and crawling all over us. The species is a very late flier and I have never seen it awing before dark.

There is a colony of Tejon bats (*Myotis yumanensis sociabilis*) in an old adobe store-house at Fort Tejon, Kern County. A new galvanized iron roof was put on this building some years since and the bats are now distributed in the cracks along the peak. On September 3 there were at least a thousand of them present and I swept many of them into a sack with my bare hands as they congregated in clusters against the angles of the rafters. They were quick to slip into cracks, and when poked at they catapulted forth, and, as often as not, flew directly in my face. On September 23 there were only two hundred left, and by December 16 all had departed. No adult males were secured in this colony. Beyond doubt this form is entirely migratory.

With us, the large brown bat (*Eptesicus fuscus fuscus*) is the commonest of the early fliers during spring and fall, but during the winter it is either absent or very rare. I suspect that this species is rare on the floor of the valley in midsummer as well, but I am usually away at that season. Their abundance may be more apparent than real, as they put in an appearance early and are such big, conspicuous fellows, they seem to be everywhere. I have first noted them on warm eve-

nings in late March, and they disappear about the time of the first very cool nights in the fall—when *Nycteris* may first be expected. Their flight is rather high, steady, and unmistakable; and they are easily shot. In buildings, during the spring, I have found a number of colonies composed of from a dozen to sixty individuals. They are fond of congregating in a narrow space with *Nyctinomus* but are apt to be found singly in almost any good situation. While examining a deserted building, if one finds a little pile of guano beneath a cranny that is just large enough for a single bat, a likely guess is that he has found the temporary home of an *Eptesicus*. If one waits about such a place until a few minutes after sunset, he may see several bats leave their retreats, one after the other, and fly off in a rising slant with head well elevated as is a poor-will's after drinking. Each female gives birth to a single young during the last few days of May or the first of June.

The pale lump-nose (*Corynorhinus rafinesquii pallescens*) is not as common on the deserts as is the leaf-nose, and I have encountered it but once. This was in the old Senator Mine, where we found about a hundred females, each with a naked young from a few days old to a quarter grown, clinging to the roof of a gallery at the two-hundred-foot level. They were in close formation but not touching one another, and, although not as wild as *Macrotus*, they were quite ready to fly. The only way in which we could capture them was wildly to grab at a bunch with both hands. In another part of the mine we found two single males in a semi-torpid condition, although the surrounding temperature was close to par. These bats appear to be larger than they really are because of their huge ears, to the formation of which and to the fact that they are folded away at times, other writers have called attention. This habit of folding the ears is indulged in whenever the animal is at rest and when no danger threatens. It is not limited to this genus, for *Plecotus* (a European genus) shares the peculiarity. When the bat is on the alert the ears are held well forward and almost parallel, but when all is quiet they are swung around to the side, either in unison or separately. Then they are "crinkled" along the outer or posterior edge until this forms into tiny accordion plaits, and the extremities are tucked safely beneath the forearms. When the animal is disturbed the ears may be partly unfurled at once, but all the motions of this operation are slow—at about the rate of a snail's pace.

During the first really warm weather in early April, pallid bats (*Antrozous pallidus pacificus*) appear in numbers in the orange groves. Stationed in a suitable spot, one is pretty sure to see them at mid-

dusk. Their large ears give them an odd appearance and their squareish forms are not to be mistaken. They often either alight on the ground or hover just above it with imperceptibly vibrating wings; usually a sign that a Jerusalem cricket has been captured. Such bulky prey is carried to a favorite station, which is generally located in an old shed or loft, but never in the same building as the day roost. Beneath these spots may be found the heads and legs of hundreds of crickets, besides the remains of a very few other insects. I have stunned the bats with blows from a board as they were entering a building with crickets in their mouths, and shot them by the light of a pocket flash as they hung from the ridge and fed. They are decidedly common in the thermal belt and occur in old buildings where a dozen or a hundred pass the days together, but invariably out of sight. Hollow partitions, or deep cracks, where they can hide in comparative safety, are necessary to their comfort, and they strongly resist any efforts to dislodge them from such retreats. When aroused, however, they are not averse to scrambling forth with such agility that it is almost impossible to catch them as they emerge. On May 11, I obtained females which contained two large embryos each.

In another paper (*Journal of Mammalogy*, vol. 1, no. 3, p. 111) I have discussed *Eumops*, and this I believe to be the only sedentary, strictly non-migratory bat in the southwestern part of the state. On the lower deserts *Antrozous* and *Corynorhinus* may linger through the winter, but on this point I am entirely unqualified to speak. *Macrotus*, as already mentioned, is considered only partly resident; and although some may consider that the Mexican free-tail (*Nyctinomus mexicanus*) spends its whole life in one locality, I believe that there is a seasonal shifting, and that further study will show that *Nyctinomus* is absent from the northern parts of its range during the coldest weather. Our colonies at any rate either dwindle or disappear during the winter, and I judge that most of those free-tails which spend the summer with us go south at the approach of cold weather, and that their places are taken to some extent by individuals from farther north.

The free-tail is our most ubiquitous bat. Not only are its colonies the most numerous but the most populous, and in northern Mexico hundreds of thousands may occur together. Just so it has any sort of cranny into which it can squeeze, it is happy, regardless of whether the site is vacant or occupied by other species. In fact, it shows considerable partiality for the company of *Eptesicus* and *Antrozous*. They may be crowded into the corner of an attic, or behind a wooden sign on a

building, where one would lay odds that they would be cooked to a crisp by the mid-day sun, but at late dusk out they swarm through a hole that seems too small for a shrew to pass, and away into the gathering darkness. When flying, their long, pointed wings are diagnostic, and one soon learns to recognize them. I have watched them at play above a pool when almost too dark to distinguish their forms, and at a time of year when their antics could not be interpreted as a form of courtship. As I sat facing the pale, western sky, one would approach swiftly—they are speedy fliers—give chase to another, and both would do a nose-dive to the surface of the water and rise up to the original height without lessening speed. Sometimes one would tire of the sport while the other continued alone; or half a dozen would join the game, diving from as many directions.

If there is not a crack for them to back into when disturbed they are quite ready to fly, or to flutter to the floor and scurry to shelter with almost the agility and speed of a mouse. When thus "running" their folded wings are kicked up in the rear, giving to their gait a ludicrous, hand-over-hand appearance. When alighting the movements are so quick that the animals appear literally to dive into a hole; and when no hole is available, they will catch on to a support by the thumbs and quickly shift head downwards. This is the normal method of alighting used by bats.

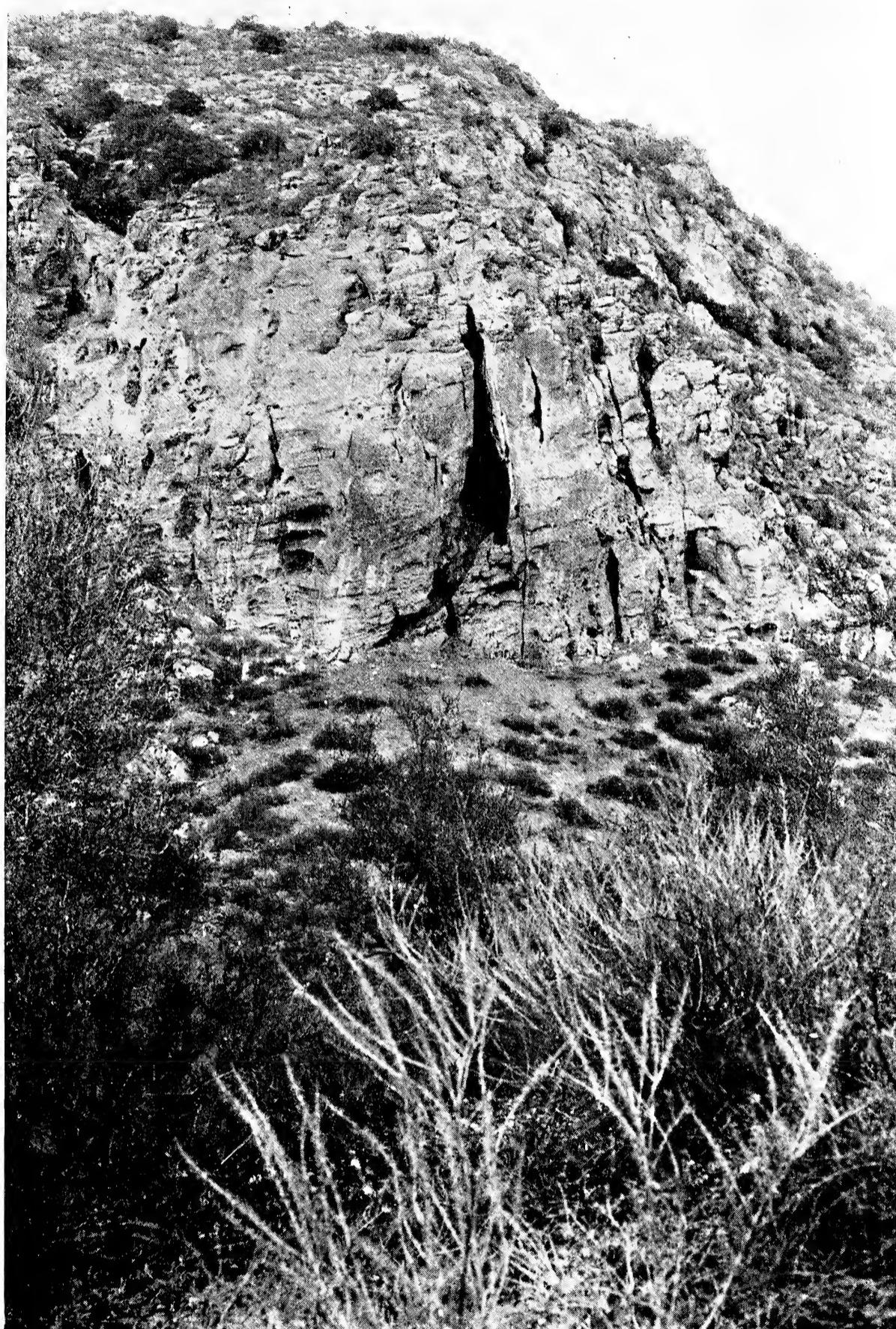
A LIST OF THE COLONIES VISITED

.1. An abandoned mine two miles north of Potholes, Imperial County, consisting of a very extensive series of connecting chambers. One or two hundred leaf-noses, evidently all males, and a single Yuma bat, May 14. Visited with L. Little.

2. Old Senator Mine, 6 miles north of Potholes, Imperial County. On the one and two hundred foot levels were a colony of a hundred female lump-noses with small young, and some six hundred Yuma bats, mostly females—one of which contained an embryo May 14, 1918. On April 13, 1916, D. R. Dickey found only a dozen lump-noses here in addition to the yuma bats, and by May 10 the former had disappeared and their places been taken by seventy-five leaf-noses. Visited with L. Little.

3. A series of old tidal caves at the base of the hills southwest of Thermal, Riverside County. No bats present January 26, but these caves are famous for their summer colonies of leaf-noses and both J. Grinnell and D. R. Dickey have secured bats from the caves in this series.

4. Extensive cave in the hills two miles north of Owensmouth, Los Angeles County, holding 6 leaf-noses April 6, none June 4, and about 30 December 14. There had been many cold nights prior to the last date and, as the end of the



LARGE CAVE NEAR OWENSMOUTH, LOS ANGELES COUNTY, IN WHICH
THERE IS A COLONY OF LEAF-NOSED BATS
(Howell: California bat roosts)

cave must have been twenty degrees warmer than the outside air, these bats were undoubtedly settled for the winter. This locality, on the coast side of the mountains, constitutes an extension of range for the species.

5. Beneath an awning on the Barbara Worth Hotel, El Centro, Imperial County. About one hundred Yuma bats October 8.

6. In the adobe store-house at Fort Tejon, Kern County. A thousand Tejon bats September 3; two hundred September 23; and none December 16. In the cracks between the adobe bricks and the roof of the adjoining ranch house are many *Antrozous* during the summer.

7. In the attic of a large building near Azusa, Los Angeles County. Sixty or seventy large brown bats mixed with a few Mexican free-tails. All were females, and a few of the former had small young May 31. At the other end of this attic there is a colony of *Eumops*.

8. In the attic of a three story house near Covina, Los Angeles County, a mixed colony of one hundred or more pallid bats and free-tails. Now walled in. In the loft of the garage to this house I have at different times taken several single free-tail and large brown bats.

9. Hay loft above a stable near Covina. A mixed colony of one hundred free-tail and pallid bats hidden in the cracks between the shingles and the end walls. In a crack under the veranda roof of the adjoining residence is a small colony of free-tails.

10. In the loft of a deserted winery near Cucamonga, San Bernardino County. A colony of twenty-five large browns and five free-tails—all females—in the space between a sliding door and the wall, April 25. Large piles of guano beneath the ridge may indicate that more bats are here later in the season, or that the spot is used as a feeding station.

11. In the attic of the residence of R. B. Herron, San Bernardino. Two hundred free-tails of both sexes, November 5. The owner states that there are several thousand here during the summer, and that a larger form, probably *Antrozous*, is present. Visited with L. Little.

12. Under the awnings of the Hollywood High School, Hollywood, many pallid bats insist upon staying, in spite of all efforts to drive them away.

13. In the cornice of the Grammar School at Colton, San Bernardino County. An unknown number of free-tails. Kindness of W. C. Hanna.

14. Behind a sign on the side of the High School at Colton. An unknown number of free-tails. Kindness of W. C. Hanna.

15. In the false, second story front of a one-story building near Azusa. Perhaps fifty free-tails.

Besides the colonies of mastiff bats, reported in another paper, I know of several other colonies of *Antrozous* and *Nyctinomus* in Los Angeles and vicinity, but these "belong" to other men, and I have never visited them. I have also heard a rumor of a colony of Tejon bats near one of the southern beaches.

A NEW KANGAROO RAT FROM THE SAN JOAQUIN VALLEY, CALIFORNIA¹

BY JOSEPH GRINNELL

The kangaroo rats of the *Dipodomys merriami* group inhabiting the great San Joaquin basin of south-central California are restricted to the Lower Sonoran life zone there and are believed to be cut off completely by continuous Upper Sonoran areas from the other representations of the group inhabiting the other southwestern tracts of Lower Sonoran. Since there is thus little chance for intermingling, it is interesting, and corroborative, to find that there is a seemingly constant character by which any individual from the San Joaquin Valley can be distinguished from any individual, of whatever race, of *merriami* from outside this area. The character in question involves the extreme base of the rostrum; the premaxillary tongues, extending backwards dorsally on either side of the nasals, are extremely narrow, and the entire rostrum at its base, in dorsal aspect, is notably narrow as compared with the condition in *merriami* from outside the San Joaquin Valley. Then, too, the sides of the rostrum are more nearly parallel to one another, and the angle made by each side with the anterior margin of the adjacent maxillary arch is better defined—less obtuse. The nasals, and the rostrum itself, are shorter.

Furthermore, within the San Joaquin basin there is geographic variation, involving other cranial features than those possessed in common, as well as features of color and general size. Three subspecies are recognizable: *Dipodomys merriami nitratoides* Merriam, of the eastern side of the valley southeast of Tulare Lake, from Tipton south to the vicinity of Bakersfield; *Dipodomys merriami exilis* Merriam, of the eastern side of the valley north of Tulare Lake, in the immediate vicinity of Fresno (perhaps now extinct as a result of the close cultivation of the country); and the race, now described, from the western side of the valley, from western Fresno County (across the river bottom lands from the Fresno district) south to near the mouth of San Emigdio Creek.

¹ Contribution from the Museum of Vertebrate Zoology of the University of California.

Dipodomys merriami brevinasus new subspecies**SHORT-NOSED KANGAROO RAT**

Type.—Male adult, skin and skull; no. 28634, Mus. Vert. Zool.; Hayes Station, near B. M. 503, 19 miles southwest of Mendota, Fresno County, California; June 30, 1918; collected by Richard Hunt; orig. no. 568.

Comparative diagnosis.—A broad-faced, four-toed, small-sized kangaroo rat belonging to the *merriami* group. In coloration nearest like *Dipodomys merriami merriami* Mearns; color tone of dorsum similar, but dark facial and tail markings averaging blacker. Coloration similar to that in *nitratoides* but paler in tone, more ochraceous. With respect to skull nearest like *nitratoides*, in that rostrum at base and premaxillary tongues are conspicuously narrower than in *merriami*, but mastoid bullæ larger and mastoid width decidedly greater, with interparietal and supraoccipital narrower. The rostrum in *brevinasus* is relatively shorter than in any other race of *merriami*. General size very slightly larger than in *nitratoides*, much larger than in *exilis*.

Measurements (in millimeters).—Of type: Total length, 252; tail vertebræ, 145; hind foot, 36; ear from crown, 11; greatest length of skull, 35.0; breadth of skull across bullæ, 23.2; spread of maxillary arches, 19.5; greatest length of nasals, 12.4; greatest width of rostrum near end, 3.1; width of rostrum close to base, 5.2; width of maxillary arch at middle, 4.7. Weight, in grams, 43.9.

Distribution.—Inhabits the *triplex* association along the western side of the San Joaquin Valley, California, from western Fresno County south to near mouth of San Emigdio Creek, in southwestern Kern County. Life zone, Lower Sonoran.

A NEW MEADOW MOUSE FROM THE CASCADE MOUNTAINS OF WASHINGTON

By WALTER P. TAYLOR

Field work in Washington State principally during the last three years has resulted in the accumulation of material which demonstrates the existence of an unrecognized form of *Microtus*, which is here described. The subspecies is named in honor of George Gordon Cantwell, field assistant of the Biological Survey.

Microtus oregoni cantwelli new subspecies

RAINIER MEADOW MOUSE

Type from Glacier Basin, 5935 feet, Mount Rainier, Washington. No. 232,814, ♂ adult, U. S. National Museum (Biological Survey collection), collected by George G. Cantwell, August 13, 1919. Original number 1487.

General characters.—A larger form of the subgenus *Chilotus* than those occurring coastwise, with tendencies to paler brown color; longer rostrum and nasals; and longer, narrower incisive foramina.

Geographic range.—The Cascade Mountains of Washington from the head of Lake Chelan and the Glacier Peak district on the north, south at least to the vicinity of Mount Rainier and Mount Aix. Apparently confined for the most part to the high Cascades. Zonal range, chiefly Canadian and Hudsonian.

Color.—The type, and a topotype (no. 320, ♂, State College of Washington, collected by W. T. Shaw) both taken in midsummer, are almost identical in coloration with the type of *Microtus oregoni bairdi* from Crater Lake, Oregon, being approximately the buckthorn brown of Ridgway (Color Standards, etc., 1912). They are distinguished from *M. o. bairdi*, however, by greater measurements throughout, as well as by the longer rostrum and incisive foramina. From typical *M. o. oregoni* or *M. o. serpens* they can be separated by color alone; *oregoni* tending to a richer brown, near ochraceous-tawny, and summer *serpens* tending to cinnamon-brown, due partly to a slightly darker shade of brown and partly to the presence of a greater number of dark hairs. *Serpens* collected in midwinter is considerably darker than typical *cantwelli*. Typical examples of the new form are grayish below, with the plumbeous hair bases showing through, and with a faint wash of buffy. Worn specimens appear darker, due to the effect of the plumbeous hair bases, and there is some variation in the color of the brown itself. Specimens from Mount Aix (Head of Hindoo Creek, 6500 feet, Yakima County) and Bumping Lake (3 miles northeast, at Goose Prairie, 3300 feet, Yakima County) closely resemble the type and topotype in color. Those from Entiat (20 miles above the mouth of the river, 1680 feet, Yakima County), Stehekin (Head of Lake Chelan, 1079 feet, Chelan County), Cascade Tunnel (3373 feet, Chelan County) and the Suiattle River (Chiwawa Mountain Fork, 4500 feet, Snohomish County), are somewhat darker. Practically all have the

faint wash of buffy beneath. One specimen from Stehekin (no. 230,435, U. S. Nat. Mus., Biol. Surv. Coll.) is identical with the type in color above, but is more strongly washed below with light ochraceous-buff.

Skull.—Compared with *M. o. bairdi* the crania are slightly longer, the rostra and nasals conspicuously so; incisor teeth tending to be longer and heavier, incisive foramina to be longer and narrower, particularly posteriorly, and zygomatica slightly heavier. Compared with *oregoni* and *bairdi*, there are observable tendencies in *cantwelli* to larger size, longer rostra and nasals, and longer and narrower incisive foramina. The crania are very similar, however, and the differences at best are slight.

Measurements.—Measurements of the type: Total length, 152; tail vertebræ, 46; hind foot, 18; nasals, 7.8; zygomatic breadth, 14.8; alveolar length of upper molar series, 5.6. Average measurements of nine adults from different parts of the range of *cantwelli*, total length 150 mm. (max. 161, min. 138); tail vertebræ 43 (max. 52, min. 34); hind foot, 18 (max. 19, min. 17); basal length, 21.9 (max. 23.4, min. 20.9); length of nasals, 7.0 (max. 7.3, min. 6.7); zygomatic breadth, 14.3 (max. 14.9, min. 14.0); mastoid breadth, 11.4 (max. 12.6, min. 11.0); alveolar length of upper molar series, 5.7 (max. 6.1, min. 5.5).

Specimens examined.—All are skins with skulls from the State of Washington. Mount Rainier, Glacier Basin, 5935 feet, 2; Mount Rainier, Sunset Park, 5000 feet, 2; Mount Rainier, Reflection Lakes, 4900 feet, 1; Chelan County, Entiat River, 20 miles from mouth, 1680 feet, 4; Chelan County, Stehekin, head of Lake Chelan, 1079 feet, 9; Chelan County, Cascade Tunnel, 3373 feet, 3; Yakima County, Mt. Aix, head of Hindoo Creek, 6500 feet, 2; Yakima County, Goose Prairie, 3 miles northeast of Bumping Lake, 3300 feet, 1; Snohomish County, Chiwawa Mountain Fork of Suiattle River, 4500 feet, 1.

Remarks.—The *Chilotus* stock, characteristic of the humid coast belt, has invaded the Cascade Mountains and, in places, penetrated to the east side. Apparently environment has effected a slight response in physical characteristics.

Intergradation of *Microtus oregoni cantwelli* with the *oregoni* stock to the west and south is shown by specimens from Scenic (McCain), 2106 feet, Snohomish County, and Signal Peak, 4000 feet, Yakima County. Examples from the west and south sides of Mount Rainier (from Sunset Park, 5000 feet, and Reflection Lakes, 4900 feet) referred to *cantwelli*, show characters tending toward *oregoni*. The extreme development of the subspecies has taken place in the higher country usually on the east slopes of the mountains, while specimens from lower altitudes, either east or west of the Cascade divide, possess less well-marked characters. Examples from lower levels of Mount Rainier National Park and nearby (Longmire Springs, 2700 feet; Mesler's Ranch, 2000 feet, one mile west of Park boundary) as well as specimens from Scenic (locality just given), Signal Peak (ditto), and Husum and Trout Lake, Klickitat County, are referred to *oregoni*.

Two specimens of *M. o. oregoni* from the north base of Three Sisters, 5,000 feet, in the Cascade Mountains of Oregon (nos. 204,722, ♂, and 204,718, ♂, U. S. Nat. Mus., Biological Survey collection) are larger than the typical form, and may be referable to *cantwelli*.

I am indebted to Prof. W. T. Shaw, in charge of the museum, State College of Washington, Pullman, Washington, for the loan of material.

GENERAL NOTES

SOME NOTES CONCERNING THE MASTIFF BAT

In Mr. A. B. Howell's recent paper on bats, the remark is made that, after trying various methods, he did not succeed in making the mastiff bat (*Eumops californicus*) fly (Journ. Mamm., vol. 1, no. 3, p. 112, 1920). I had the opportunity to study several of these bats taken with Mr. Howell at Colton, Riverside County, California. The bats were placed in a large screen porch where there was ample room for them to fly. One afternoon while trying various experiments with the animals, I succeeded in making one bat take wing from the floor. It flew up about two feet and made a semicircular flight of about ten feet and then lunged to the floor again. This attempt looked rather encouraging, but as hard as I tried, I could not make the bat fly again. On warm days the bats were very active, and when disturbed they scampered about seeking a dark corner, or something to crawl under. When they bumped into the wall, or any perpendicular object, they began to climb head forward until off of the floor, and then turned and climbed backwards, pulling with each foot alternately.

—*Luther Little.*

South Pasadena, Calif.

AS TO THE WOLVERINE

The story which tells that the "glutton" or wolverine secures its prey by lying in wait on the branches of a tree for a deer to pass under it and dropping on the deer's back and killing it has been the text for not a little jocular writing. Coues laughed at it and says of the wolverine, "It is imperfectly plantigrade and does not climb trees like most of its allies." Most people regard the tale as fable. Is it so, or has it—like many other traditions—a basis of fact?

Little seems to be known of the wolverine's habits. A few trappers have told of the mischief it does along the trap line, but except for that, not much has been written of its ways of life; and of what has been told, almost none is at first hand. The animal seems hardly to have been observed by naturalists.

It is generally stated that the wolverine does not attack large animals, but lives on grouse and rabbits and other small creatures. This means only that because—in the opinion of the writers—it is not sufficiently active to catch them, therefore it does not attack large animals. It will subsist on whatever food is most easily accessible and this may cover a wide range of species, from

mice to moose. Mr. Charles Sheldon has seen the tracks of wolverines in winter on the crests of the mountains in Alaska, apparently following sheep tracks and sheep trails, and this suggests that they may kill sheep. But we know nothing about the matter.

We have some evidence that the wolverine has plenty of courage and that it does attack the largest animals. A dozen years ago there was printed an account, by Mr. J. Keele,¹ of a case where a wolverine had attacked a moose. Mr. Keele and his companion came upon a moose in a hole in the deep snow, killed it, and found that the animal had been injured by a wolverine which appeared to have climbed trees and to have dropped on the animal's back. Hair had been torn from the moose in many places and on its back there was "a large hole apparently freshly gnawed into the animal's backbone, the spinal cord being almost laid bare." Mr. Keele gave many details of the evidence that he saw of the actions of the moose and of the wolverine during this contest, which may have lasted for two or three days.

Martin Hunter, an old Hudson's Bay man who was in the service of that company from 1863 to 1903, during which years he traveled over much of the eastern half of North America, contributed during a number of years to certain outdoor periodicals many brief sketches of life in the open, and in one of them gives an account which closely matches the old story derided as fable, for he tells of seeing a wolverine kill a caribou to the back of which it was clinging. This is the account:

"A few moments after, we saw a large caribou break cover about one hundred yards to the right and spring into the lake; but what was that black object clinging to his neck? Surely some animal!"

"The caribou struck out as fast as it could swim, heading for the further shore, and we jumped into our canoe and gave pursuit. The keen eyes of the animal on the caribou's neck having detected us, it relinquished its hold, dropped off into the water, and turned for the shore the caribou had left.

"The canoe was immediately headed to cut off his retreat and when within proper distance, I shot it with one barrel, and left it there dead on the surface of the lake, while we continued on our chase.

"This diversion had taken our attention from the caribou, but now, when we had resumed the chase, we found the animal was getting through the water very slowly, and as we were paddling in its wake, we perceived the water at each side of the caribou was bloody. By the time we reached the caribou it was dead.

"On examination, we found the jugular vein had been cut by the fierce animal on its back and it had bled to death, fleeing with what strength it had, to the last drop of the poor thing's blood."

"We threw a string over its horns and towed it back to the portage, picking up in passing our floating black animal, which proved to be a very large wolverine, carajo, or Indian devil, the beast going under all of these names with hunters and traders."—Canadian Indian Wilds, p. 150, Columbus, 1907.

I have seen the wolverine alive in the wilds on but few occasions and know nothing as to its tree-climbing powers. Mr. Keele distinctly says he saw marks where it had climbed a tree. Mr. Sheldon has seen it run up a tree, when

¹ Forest and Stream, Vol. LXXI, p. 971.

chased by dogs, as easily as would a coon. This seems conclusive, for if a wolverine chased by a dog runs up a tree, that implies knowledge that a dog—i.e., a wolf—cannot climb, and that a tree is a refuge; hence tree-climbing ability—and some tree-climbing practice.

I have read somewhere of a wolverine climbing one of the vertical poles to reach a platform above the ground in order to get at packages that were stored on the platform. At all events positive testimony that a wolverine has been seen to run up a tree disposes of the opinion expressed by Doctor Coues that the wolverine does not climb trees.

The accounts given by Messrs. Hunter and Keele and the evidence from Mr. Sheldon suggest that some of those who have written about the wolverine were no better informed about it than ourselves.

Mr. Hunter, as already said, was for forty years in the service of the Hudson's Bay Company, and for the last twenty years was a commissioned officer in that service. I have no personal knowledge of him, but am disposed to credit his statement.

Wild animals often perform unexpected acts which are wholly at variance with our preconceived ideas of them, and because these actions are new, and perhaps contradict our old ideas, we are likely to doubt the accuracy of the observation, and find it hard to believe what is told us. A few years ago when Mr. Sheldon reported the killing of a mountain sheep by a lynx some of us were much astonished, yet the same thing had been reported one hundred years before—but we did not know it. Mr. Sheldon's extraordinary experience, on Montague Island, Alaska, with the bear which unwittingly ran against him and knocked him down but did not attack him, is another incredible happening. So also is the act by a black bear in the Northwest Territories which crossed a river, came out on the bank, and there killed and began to eat a man.² This happening was related by Mr. J. H. McIlree who was long an officer of the Northwest Mounted Police, well known to me, and absolutely trustworthy. It was supported by affidavits of two men who were present.

—George Bird Grinnell.

A CALIFORNIA RECORD OF *MICROTUS OREGONI BAIRDII*

At the time of its description (C. H. Merriam, Proc. Biol. Soc. Washington, vol. 11, p. 74, 1897), the Baird meadow mouse (*Microtus bairdi* as then known) was represented by only two specimens, both collected at the type locality (Glacier Peak, 7800 feet, Crater Lake, Oregon). Three additional examples were collected in September, 1905, by J. F. Ferry at Beswick, California (Nos. 139,195 to 139,197, U. S. Nat. Mus., Biological Survey Collection). This record is of special interest because it adds one more species to the list of California mammals.

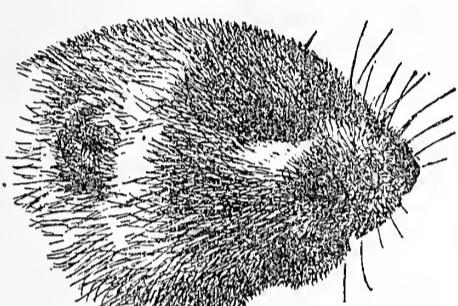
Comparison of specimens of *bairdi* with specimens of *Microtus oregoni oregoni*, from the vicinity of Astoria, Yaquina Bay, Wells, and Oregon City, Oregon, shows the differences between them to be subspecific rather than specific.

—Walter P. Taylor.

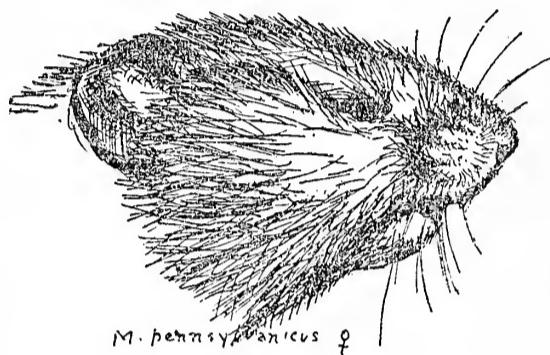
² Forest and Stream, Vol. LXVIII, p. 974, June 22, 1907; Vol. LXX, p. 214, February 8, 1908.

THE MOLE-MOUSE, POTATO-MOUSE OR PINE-MOUSE

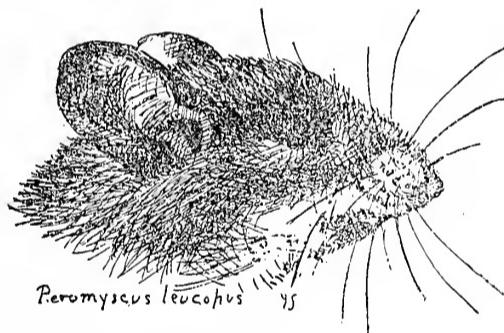
In 1908 I built a hollow tree 7 feet through and 35 feet high, on an island of my lake at Cos Cob, Connecticut. It was intended to be a sort of observatory of the birds and beasts that commonly harbor in such places. I made a great variety of nesting boxes, and arranged all so that, while hidden inside, I could observe them. On November 12, a screech owl established himself in one of the hollow limbs and in the dark corner of the place soon had a regular storehouse of surplus provisions. On December 17, I found in this owl's larder a specimen of *Microtus pinetorum scalopsoides*, sometimes called pine-mouse, the first record for Connecticut. This led to a renewal of trapping activities with the



M. pinetorum scalopsoides ♂



M. pennsylvanicus ♀



Peromyscus leucopus ♀

result that I got as many of these mice as I wished; but not at all in the places, or under the circumstances, that are commonly mentioned as congenial. All of them were taken in the potato field, where they lead a life much more subterranean than that of meadowmice, but less so than that of moles. The name *scalopsoides* then is very suitable.

Quite commonly field naturalists, when they find a new animal in their traps, are struck by its great unlikeness to others of its group. The facial lines and expressions as well as the body contour, are very different. Unfortunately these important matters are destined wholly to disappear in the museum skin. With this thought in mind I have drawn from fresh specimens of mice as they came to hand. I hope they illustrate my point.

—Ernest Thompson Seton.

THE WHITE-TAILED JACK RABBIT, *LEPUS TOWNSENDII CAMPANIUS*, INTRODUCED
INTO WISCONSIN

The occurrence of *Lepus townsendii campanius* Hollister as a native mammal in Wisconsin has always seemed to me more or less of a possibility. It was, therefore, not entirely a surprise when on August 13, 1918, I saw numerous tracks, which appeared to belong to this species, on the sand barrens north of the Chippewa River at Meridean, Dunn County, Wisconsin. Although careful search was made for the animals in the limited time at my disposal, none was seen. Returning to the village I made inquiry of several residents and learned that these jack rabbits were *not* native, but had been introduced from Minnesota about the year 1908 and that they had thrived very well. The next day, August 14, a mounted specimen in winter pelage, which had been collected on these sand barrens about 1912, was examined in the collection of Mr. John N. Clark, of Meridean, Wisconsin.

—Hartley H. T. Jackson.

MEASUREMENTS OF AN UNUSUAL ELK HEAD

The following measurements of the head of a fine old male elk (*Cervus canadensis*) which was found dead near the northern boundary of the park, February 25, 1920, were made by me in the course of work at the museum, National Park Service, Yellowstone Park, Wyoming. While the lengths of horn and tines are not extraordinary, I can find no record of larger measurements of circumference of beam.

Right hand horn		Left hand horn
45	Length of beam	48
17½	1st tine	17½
14½	2d tine	12½
15½	3rd tine	13½
17	4th tine	7
13	5th tine	17½
4	6th tine	6
none	7th tine	9
Total length beams and tines 21 ft. 6½ in.		
12	Circumference at burr	12
	Circumference between	
8¾	1st and 2d tines	8½
8½	2d and 3rd tines	8¼
9½	3rd and 4th tines	9½
Widest spread 50 inches		
Widest spread inside of beams 38 inches		

—M. P. Skinner.

Yellowstone Park, Wyoming.

DEATH OF JAMES M. MACOUN

On January 8, 1920, James M. Macoun, chief of the Biological Division of the Geological Survey of Canada, died at his home in Ottawa. He was born at Bellville, Ontario, in 1862, and was the son of the venerable botanist of the Dominion, Prof. John Macoun, who, it is a pleasure to state, is still living.

James Macoun, though primarily a botanist, inherited also his father's interest in birds and mammals. During the thirty-six years of his service with the Geological Survey of Canada, of which he was appointed assistant naturalist in 1898, botanist in 1917, and chief of the Biological Division in 1918, he traversed many remote and little known parts of the Dominion, from Lake Mistassini, Hudson Bay, and Churchill River westerly to Lesser Slave Lake and Peace River and various parts of British Columbia, collecting specimens and field notes that form an important part of the Victoria Museum at Ottawa; and for a number of years largely directed the field work of William Spreadborough when making his well-known collections of mammals and birds for the Canadian Government.

In 1910, while studying the flora and fauna of the west coast of Hudson Bay, the vessel was wrecked and the party obliged to escape in a small boat. Fortunately, they were rescued and taken to Fort Churchill, from which remote outpost they made the overland journey to Lake Winnipeg on foot in the depth of winter.

James Macoun assisted his father in the preparation and editing of the two editions of the extensive and exceedingly useful work entitled "Catalogue of the Birds of Canada."

In 1901 he visited the Pribilof Islands in Bering Sea as Canadian secretary to the British Fur-Seal Commission and in subsequent years (1906 and 1914) returned to the Islands in connection with the fur-seal controversy.

I first met James Macoun at his father's home in Ottawa in the early 80's and was with him at the Pribilof Islands in 1891, since which I have seen him from time to time during his occasional visits to Washington. As a naturalist, he inherited much of his father's enthusiasm and kindly helpful disposition, so that in both field and office he was an agreeable companion. His sympathies were with those in the humbler walks of life; his motto was "Equal opportunity for all."

He is survived by a wife and daughter, and, as a recent writer adds, "by a host of friends and sorrowing colleagues."

—C. Hart Merriam.

DEATH OF THOMAS M. OWEN

Dr. Thomas M. Owen, of Montgomery, Alabama, a member of the Society, died March 25, 1920, in the fifty-fourth year of his age. He was a prominent historian, author of several important historical works, and director of the Department of Archives and History, State of Alabama. He took a deep interest in the advancement of natural history and was engaged in building up under his department in the State Capitol an exhibition collection of local birds and mammals.

—Arthur H. Howell.

RECENT LITERATURE

Goldman, Edward A. MAMMALS OF PANAMA. Smithsonian Misc. Coll., vol. 69, no. 5, pp. 1-309, text figures 1-24, pls. 1-39. 1920.

Goldman's "Mammals of Panama" is an excellent summary of existing knowledge of the mammal fauna of one of the most interesting portions of tropical America, interesting not only on account of its varied topography and consequent diverse conditions of environment, but especially from its geographic position, "forming as it does a slender artery blending the complex elements or converging life currents of two continents, through which countless migrations of non-volant terrestrial animals probably passed during the Tertiary or early Quaternary ages." The work is based primarily on the author's personal explorations and field work, for which he was detailed from the Bureau of Biological Survey, United States Department of Agriculture, in December, 1910, in coöperation with other departments of the Government in a Biological Survey of the Panama Canal Zone under the auspices of the Smithsonian Institution. Mr. Goldman's explorations were made in the Canal Zone and in eastern Panama, where he prosecuted field work for about six months in 1911, and for about the same period in 1912, devoting his attention mainly to mammals and birds. He has, however, availed himself in the preparation of this report on the mammals of all the mammal material obtained in Panama, both prior and subsequent to his own explorations, contained in American museums, and has thus been able to correlate the published results of other workers through a critical examination of the actual specimens on which their results were based. Fortunately for the completeness of his monograph, he has been able to utilize much of the material obtained by J. H. Batty (now in the American Museum of Natural History) and that of W. W. Brown, collected for the Bangs Brothers (now in the Museum of Comparative Zoology at Cambridge) in western Panama (province of Chiriquí and the Coiba and Perlas Islands), and the collections made by H. E. Anthony and W. B. Richardson in southeastern Panama for the American Museum of Natural History in 1914 and 1915. This, with a few other smaller collections available for examination forms a large total, but still, says the author, "Exploration of mountain ranges between the Canal Zone and the lofty Volcan de Chiriquí would add much to our knowledge of the distribution of many mountain mammals now known only from the extreme eastern or western parts of the republic."

The general introduction contains the author's itineraries and a summary of other explorations (pp. 4-18) followed by an account of the physiography and climatology (pp. 19-23), and a discussion of the faunal relations and life zones of Panama. The mammalian fauna of Panama, as a whole, "is South American in the sense that most of the genera and many of the species are common to both regions." The eastern and western parts present important faunal differences, the eastern being "more truly South American, especially the mountainous parts, while western Panama partakes of the character of the Central American subregion." That the Canal Zone tends "to delimit faunas is indicated by the distribution of various species."

Three life zones are recognized: (1) a Lower Tropical, (2) an Upper Tropical, and (3) a Temperate. The Lower Tropical Zone is an area of high temperature and includes "by far the greater part of the Isthmian land surface from the

Atlantic to the Pacific," ranging to about 3000 to 3500 feet altitude on the slopes of the higher mountains. It is divided into two nearly parallel areas, the humid or northern, and the arid or southern, characterized by a greater and more continuous rainfall in the humid area. The Upper Tropical Zone is of comparatively small extent, occupying four small isolated areas, two at the eastern and two at the western end of the republic. It occupies the crests and slopes of the mountains up to about 8000 feet. The Temperate Zone is confined to a small area on Volcan de Chiriqui above an altitude of about 8000 feet. The life zones are indicated in color on the accompanying large-scale map, which shows the drainage and locality names with great distinctness. The faunal zones and areas are characterized in the text by not only their physiographic features but by lists of their characteristic mammals, birds and plants. The author calls attention (p. 25, footnote) to the agreement, in their general bearings, of the life zones of Panama, as here worked out, with those established by Doctor Chapman for Colombia, based on the birds. "Although working independently," he says, "the results are substantially in accord regarding the number, approximate boundaries, and appropriate nomenclature of the zones."

The "General Account of the Mammals" occupies nearly two hundred pages and includes 175 forms (species and subspecies).¹ The treatment consists of brief general comment under the higher groups, a reference to the place of original description of the species or subspecies and statement of the type locality, with synonyms when such exist, followed by remarks on the distribution, habits and relationships of the forms, and finally a list of the specimens examined and their localities, and, when not contained in the National Museum, the name of the museum to which they belong. It is therefore an elaborately annotated faunal list of the known mammals of Panama, with hitherto unpublished field notes of the author and all available information on the ranges and life histories of the forms recorded, supplemented by historical and technical information where such comment is required. The work is also liberally illustrated. The first nineteen of the thirty-nine halftone plates are scenic, effectively illustrating the physiography and the vegetation of various types of environment. The remaining twenty halftone plates illustrate the type skulls of forty-six forms of mammals, all but three of which were originally described by the author in earlier papers. Noteworthy among these are *Neacomys pictus* and *Icticyon panamensis*, which greatly extend the known range of their respective genera. The text illustrations consist of life size figures (front views of head) of twenty-four of the thirty-three genera of bats here recorded from Panama. An annotated list of sixty-seven titles of papers (by twenty-nine authors) cited in the text, and an index of forty-three pages complete a work of great merit and permanent value. The "Mammals of Panama" is thus a critical and comprehensive review, for which specialists of Central American mammalogy, as well as a much broader clientele, should feel deeply grateful.

—J. A. Allen.

¹ These are listed on pages 42-44, but are not numbered, nor are the authorities for the names included, nor are page references given. Had these been included, and the list inserted as part of the table of contents, it would have greatly facilitated finding any desired species in the text. Apparently the number of forms is nowhere stated, although an item of statistical information usually of much interest.

Joleaud, L. LES MIGRATIONS DES MAMMIFÈRES AMÉRICAINS ET AFRICAINS A TRAVERS LES RÉGIONS ATLANTIQUES PENDANT LES TEMPS NÉOGÈNES. Revue générale des Sciences, Paris, vol. 30, pp. 704-713, figs. (maps) 1-9, December 30, 1919.

Professor Joleaud is convinced that free interchange of mammalian life between North America, Africa and Europe took place during the Tertiary period by way of land masses occupying much of the area of the present Atlantic Ocean and persisting intermittently as late as the beginning of the Pliocene. He presents the reasons for this belief in a paper accompanied by nine maps showing the exact transatlantic courses pursued by the following mammals: (1) the zalambdodont Insectivora (from western North America to the West Indies, western Africa, and Madagascar, with a side branch to southern South America), (2) the *Kalobatippus-Anchitherium* group of horses (from Oregon to Spain and China); (3) the archaic mastodons (from the Mediterranean region to Florida), (4) the *Hipparrison* group of horses (from Florida westward across North America and eastward to Europe, northern Africa, China), (5) the Old World porcupines (from South America by way of the West Indies to Spain and west Africa; thence to Indo-China), (6) The Hippotragine antelopes (from the Mediterranean region to the southern United States and Nebraska), (7) the *Procyonidæ* (from North American to South America and from southern Florida to the Mediterranean region, England and southeastern Asia), (8) the *Leporidæ* (from Texas to the Mediterranean), (9) the Tragelaphine antelopes (from the Mediterranean region to Nevada). The text is no less positive than the maps. "It is also by the Atlantic route," Professor Joleaud writes (p. 708-709), "that the genus *Hystrix* migrated into the Old World. This rodent, which originated in South America, could not have crossed by way of North America, practically no mammal of La Plata having entered that country between the Montien and the Astien. The family *Hystricidæ* was represented in the lower Miocene, in Patagonia, by the genera *Acaremys* and *Steiromys* related to existing Argentinian types. Arboreal in the New World these animals have become burrowers in Africa, in the south of Asia and of Europe, exactly like another African rodent, *Xerus*, which originated in North America and came to France in the Tortonian. The migration of porcupines from South America to Africa and then to Europe probably took place at a geological period which was not favorable to arborescent vegetation, perhaps under the influence of a steppe climate like that of the Pontien." This passage may be taken as representative of the entire paper. I have chosen it for translation and analysis merely because it deals with a group on which I have recently been working.

That the genus *Hystrix* or the family *Hystricidæ* originated in America there is no evidence. No American fossil has yet been found that certainly represents either the genus, the family, or a type which is directly ancestral. A few fossil teeth resembling molars of *Hystrix* are known from the Miocene of North America; but in the absence of the essential parts of the skull the systematic position of the animals represented by such fragments is impossible to determine with certainty, though at present the species are referred with little doubt to genera related to the beavers. The South American *Acaremys* and *Steiromys* were members of the families *Echimyidæ* and *Erethizontidæ* respectively. These two groups, like all the other American families of *Hystricoidæ*, are not yet known to

have ever occurred in the Old World. In each of them the tooth structure represents a peculiar and specialized type, while in the true *Hystricidae* the teeth are more primitive than in any other known hystricoids. Derivation of the Old World porcupines from these American rodents cannot therefore be regarded as even a remote possibility. Hence it is scarcely necessary to give special consideration to the curious idea that the arboreal South American ancestors of *Hystrix* may have become terrestrial and fossorial while traversing trans-Atlantic steppes. Among the few described fossil American squirrels there is none whose characters furnish any proof that it was ancestral to the African genus *Xerus*. Finally the assumption that the *Hystricidae* originated in the American Miocene is rendered unnecessary by the fact that two hystricoid genera,¹ *Phiomys* and *Metaphiomys*, are known from the Egyptian Oligocene. While these Egyptian animals cannot now be definitely referred to any family, and the teeth are too specialized to have given rise to the type of dental structure found in *Hystrix* and its allies, the presence of such fossils at this horizon shows that the hystricoid group is so ancient in the Old World that the supposed Tertiary migrations from South America are not required to explain its history.

Analysis of the evidence advanced in demonstration of the other migrations appears to reveal an equal degree of inconclusiveness. The history and distribution of the zalambdodont insectivores, for instance, which leads Professor Joleaud to map a route from central North America through the West Indies to West Africa, convinces Doctor Winge² that the group originated in the Old World and crossed to America by way of northern Asia. Another example: *Kalobatippus præstans* has been found in Oregon; *K. agatensis*, a "more advanced" form, has been found in Nebraska; therefore the animals migrated from the Pacific to the Mississippi. By a continuation of this reasoning the group is carried eastward to Europe and thence to China.³ Similar evidence is supposed to show that early mastodons moved from Egypt westward to Florida and Nebraska.

Surmises and inaccuracies⁴ such as those which form the substance of this paper will not deceive persons who have some knowledge of mammals living and extinct. Supported as they are, however, by the reputation of the *Revue générale des Sciences* and by the clearness and apparent authoritativeness of both the maps and the text, they are capable of spreading a wholly wrong impression among less informed readers. Mammals have not been shown to furnish the evidence needed to prove that trans-Atlantic land masses occurred in Tertiary times; neither is it clear that an explanation of their distribution is made more simple by the assumption that such land existed. The enormous blank spaces in the geological record allow, it is true, ample room for conjecture, but this is no justification

¹ See Miller and Gidley, *Journ. Washington Acad. Sci.*, vol. 3, p. 445. July 19, 1918.

² *Vidensk. Medd. fra Dansk naturh. Foren.*, vol. 68, p. 163, 1917.

³ "Ainsi *Kalobatippus-Anchitherium* aurait immigré de la côte pacifique au Mississippi puis en Europe par l'Atlantique central enfin en Chine" (p. 707).

⁴ In summarizing the character of the Antillean fauna (pp. 712-713) the author omits all allusion to nine genera of extinct mammals described by Allen, Anthony and Miller during the years 1916 and 1917.

either for basing hypotheses on an inadequate understanding of that which is actually known or for presenting conjectures in the form of established facts.

—G. S. Miller.

Shaw, William T. THE COST OF A SQUIRREL AND SQUIRREL CONTROL. State College of Washington, Agr. Exp. Stat., Pop. Bull. no. 118, pp. 1-19, 11 figs. January, 1920.

Estimates of damage done to growing crops by noxious rodents are good so far as they go, but inevitably leave much to be desired. So far as known Professor Shaw is the first American author to present a quantitative study of damage done by a destructive rodent in growing grain. The rodent dealt with is the common Columbian ground squirrel (*Citellus columbianus*) of eastern Washington and neighboring states; the grain was wheat of the variety known as Hybrid 128; the location Pullman, Washington. Wheat was sown on a typical piece of ground in October, 1918. Before winter a part of the land was divided into sections 50 by 50 feet which were fenced to retain the squirrels. Immediately adjoining each squirrel plot was a check plot of similar size, slope, and soil. Photographs of the growing grain and of the amount of wheat and straw actually harvested make graphic the devastation in the squirrel-infested plots. Forty-one pounds of wheat were obtained from 500 square feet of the check plot as compared with four pounds from an equal area of the squirrel-infested plot. Similarly nine sheaves of straw were harvested from the check plot as against one sheaf from the squirrel-infested plot. The average destruction per squirrel in the experiments described was found to be $50\frac{1}{2}$ pounds "which at a price of \$2.10 per bushel for hard winter wheat was worth \$1.76." The number of squirrels per acre varies but where uncontrolled may be as high as 25. If each squirrel does \$1.76 damage annually the burden on the community is seen to be enormous.

Following the description of the experiments a number of interesting facts are given regarding the life history of the species. The handsome illustrations of young in various stages of growth, of the hibernating squirrel, and of the dens admirably supplement the discussion in the text. Different means of squirrel-control, namely poison, gas, trapping and exclusion, are taken up in the final section of the paper.

Two points combine to make this paper of extraordinary value: the thorough life history studies on which it is based, and the quantitative methods used.

—Walter P. Taylor.

B[allou], H. A. RATS IN THE WEST INDIES. Agricultural News, Barbados, vol. 18, pp. 406, 407. December 27, 1919.

"Rats continue to do a considerable amount of damage to sugar canes in the West Indies, in spite of the activities of the mongoose. In Jamaica, it would appear that rats are pests of the first importance. A glance through the indexes of the volumes of the Journal of the Agricultural Society will reveal numerous references to rats in recent years. These relate to short articles on the damage done by rats, to brief notes by the editor, from correspondents on the importance of taking all possible action against rats, etc. There are also notes on rat traps, rat virus, and rat poisons. In one volume—that for 1908, for instance—there appear thirty-one page references to these headings.

In Barbados, a Commission was appointed on September 25, 1911, to take evidence with a view to determining in what districts of the island rats have increased and are damaging the cane crops, and to take such steps as may be necessary to ensure that a proper number of mongooses be sent from those districts to a person to be appointed to examine the contents of the stomachs of 100 mongooses, with a view to ascertaining whether they are of much use in the destruction of rats."

"The report concludes with the following: 'We are of opinion that the benefit to the cane crops derived from the presence of the mongoose is so great, that a stop should at once be put to their destruction, and we therefore recommend that the Mongoose Destruction Act of 1904 be repealed.'

As an appendix to the report, figures were given to show the number of rats and mongoose killed and recorded since the Acts came into force, and up to October, 1911. The number of rats killed and paid for during the period 1908-9 to 1911, was 56,578, while the figures for the mongoose during the same period were only 33,974."

The Report of the Select Committee of the House of Assembly in 1917 came to the conclusion that the operations against the mongoose ought to be continued under the provision of the Mongoose and Rat Destruction Act, 1909, but nothing is said about the destruction of rats.

—G. S. Miller.

ALLEN, GLOVER M. Dogs of the American aborigines. Bull. Mus. Comp. Zool., vol. 63, pp. 431-517, plates 1-12. March, 1920. (History, origin, and descriptions of the breeds of American aboriginal dogs; with remarks on the origin of the domestic dog, its specific status, and the crossing of dogs with wild species of Canidæ.)

AMERICAN BISON SOCIETY. Report for 1919-20, pp. 1-95, 22 illustrations. 1920. (The twelfth census of American bison, taken January 1, 1920, shows 3393 in the United States, 5080 in Canada, and 66 in foreign countries; a total of 8539 pure bred living animals.)

BARTHOLOMEW, JAMES. Number of young in stoat's family. Scottish Nat., p. 181, November-December, 1919. (Records a litter of eleven young stoats.)

CADWALADER, WILLIAMS B. Report of the board of directors. Forth-eighth Ann. Rep. Zool. Soc. Philadelphia, pp. 1-18. 1920. (Mammals exhibited in the Philadelphia gardens for the first time include *Cebus flavesiensis*, *Lagothrix infumatus* and *Dasyprocta variegata*.)

COOPER, HAROLD J. The hypophysis cerebri of the California ground squirrel, *Citellus beechyi* (Richardson). Amer. Journ. Anat., vol. 26, pp. 185-207, November, 1919.

DAVIDSON, WINIFRED M. See Wroughton, R. C., and Winifred M. Davidson.

DEHAUT, E.-G. Contributions à l'Étude de la Vie Vertébrée Insulaire dans la Région Méditerranéenne Occidentale et particulièrement en Sardaigne et en Corse. Paris, Paul Lechevalier, 1920. pp. 1-95, pls. 1-3, text figs. 1-27. Price 15 fr. (Contains a number of articles wholly or partly on mammals.)

DIXON, JOSEPH. Control of the coyote in California. Univ. of Calif. Exper. Station Bull. no. 320, pp. 379-397. April, 1920. (Discusses the good and bad points of the coyote, recommends control rather than extermination, and gives directions for reducing the numbers of this animal.)

- DONALDSON, HENRY H. Quantitative studies of the growth of the skeleton of the albino rat. Amer. Journ. Anat., vol. 26, pp. 237-314. November, 1919. (Prepared with the assistance of Sara B. Conrow.)
- Fox, HERBERT. Report on the laboratory of comparative pathology for the year ending February 29th, 1920. Forty-eighth Ann. Rep. Zool. Soc. Philadelphia, pp. 19-34. 1920. (Data on autopsies held at the Philadelphia zoological gardens.)
- GRINNELL, GEORGE BIRD. A chapter of history and natural history in old New York. Nat. Hist., vol. 20, pp. 23-27. January-February, 1920. (Includes a few mammal notes.)
- GYLDENSTOLPE, NILS. On a collection of mammals made in eastern and central Borneo by Mr. Carl Lumholtz. Kungl. Svenska Vet.-Akad. Handl., vol. 60, no. 6, pp. 1-62, figs. 4, pls. 6. 1919. (New forms: *Galeopterus lechei*, *Petaurista petaurista lumholtzi*, and *Hylopetes harrisoni caroli*. The collection includes 51 forms. The paper concludes with a list of the mammals known to inhabit the mainland of Borneo and a list of works on Bornean mammals, 1870-1917.)
- HANSON, FRANK BLAIR. The ontogeny and phylogeny of the sternum. Amer. Journ. Anat., vol. 26, pp. 41-115, September 15, 1919. (Considerable of this discussion is devoted to mammalian sterna.)
- HARPER, FRANCIS. Okefenokee Swamp as a reservation. Nat. Hist., vol. 20, pp. 28-41. January-February, 1920. (Contains a few notes on mammals.)
- HILZHEIMER, MAX. Dritter Beitrag zur Kenntnis der Bisonten. Arch. f. Naturgesch., Jahrg. 84, Abt. A, Heft 6, pp. 41-87, figs. 1-25. February, 1920. (Old World species, mostly fossil.)
- HINTON, MARTIN A. C. The field mouse of Foula. Scottish Nat., pp. 177-181. November-December. 1919. (Describes *Apodemus fridariensis thuleo*, subsp. nov., from the island of Foula, Scotland.)
- HINTON, MARTIN A. C. See also Thomas, Oldfield, and Martin A. C. Hinton.
- LANGE, D. Sights and sounds of the Northwoods. The North Woods. Official Bull. Minnesota Forestry Assoc., vol. 7, no. 10, pp. 24-32. December, 1919. (Notes on the moose in Minnesota, pp. 29-32. To be continued.)
- LEWIS, FREDERIC T. The course of the Wolffian tubules in mammalian embryos. Amer. Journ. Anat., vol. 26, pp. 423-435. January 15, 1920.
- LÖNNBERG, EINAR. Remarks on some Congo mammals. Rev. Zool. Africaine, Bruxelles, vol. 7, pp. 236-248. 1920. (New subspecies: *Felis serval kivuensis* from Kivu district, and *Potamochærus porcus albinuchalis* from district of Lake Leopold II.)
- LUTZ, FRANK E. Scientific zoölogical publications of the American Museum. Summary of work on whales. Nat. Hist., vol. 20, pp. 107-109. January-February, 1920. (Reviews of papers on *Kogia* and *Ziphius*.)
- MILLER, G. S., JR. Australian expedition. Exploration and field-work of the Smithsonian Institution in 1919. Smithsonian Misc. Coll., vol. 72, no. 1, pp. 28-32, figs. 30-32. 1920. (Account of the work of Charles M. Hoy in Australia, with an interesting figure of two young duck-bills in their nest.)

- MITCHELL, P. CHALMERS. Official guide to the gardens of the Zoological Society of London. Eighteenth edition, with 52 illustrations from photographs of animals now or recently living in the gardens, taken by F. W. Bond, F. Martin Duncan, F. Z. S., and D. Seth-Smith, F. Z. S. 110 pages. London. 1920.
- MURRAY, HENRY A., JR. The development of the cardiac loop in the rabbit, with especial reference to the bulboventricular groove and origin of the interventricular septum. Amer. Journ. Anat., vol. 26, pp. 29-39. September 15, 1919.
- SETON, ERNEST THOMPSON. The habitat and home life of the kangaroo rats of our western desert. Journ. Washington Acad. Sci., vol. 10, pp. 306-307. May 19, 1920. (Brief abstract of an illustrated lecture given before the Biological Society of Washington.)
- SHUFELDT, R. W. Weasels and their habits. Amer. Forestry, vol. 26, pp. 163-169, figs. 1-10. March, 1920. (Popular account of the North American species.)
- STOCK, CHESTER. Origin of the supposed human footprints of Carson City, Nevada. Science, n. s., vol. 51, p. 514. May 21, 1920. (Record of *Mylodon* remains in the Pleistocene deposits at Carson City.)
- STONE, WITMER. The use and abuse of the genus. Science, n. s., vol. 51, pp. 427-429. April 30, 1920. (A sane discussion of the problems of genera, subgenera, and technical names.)
- SWENK, MYRON HARMON. On a new subspecies of otter from Nebraska. University studies, Lincoln, Nebraska, 1918. Separate, pp. 1-6, pl. 1. May 15, 1920. (*Lutra canadensis interior* subsp. nov., from Lincoln Creek, Seward County.)
- TAYLOR, WALTER P. Notes on mammals collected principally in Washington and California between the years 1853 and 1874 by Dr. James Graham Cooper. Proc. California Acad. Sci., ser. 4, vol. 9, pp. 69-121. July 12, 1919. (An interesting summary of Doctor Cooper's work and notes on 114 of his specimens of mammals still extant in American museums.)
- TAYLOR, WALTER P. Saving the Yellowstone elk herds. Conservationist, vol. 3, no. 1, pp. 3-6, 2 figs. January, 1920.
- THOMAS, OLDFIELD. Notes on the genus *Cheliones*. Journ. Bombay Nat. Hist. Soc., vol. 26, pp. 726-727. October 20, 1919. (Describes *Cheliones hurrianae collinus*, subsp. nov., from Kohat, Northwest Frontier, India.)
- THOMAS, OLDFIELD. Some new mammals from Mesopotamia. Journ. Bombay Nat. Hist. Soc., vol. 26, pp. 745-749. October 20, 1919. (New: *Eptesicus hingstoni*, *E. walli*, *Pipistrellus coxi*, *Paraechinus ludlowi*, and *Gerbillus cheesmani*.)
- THOMAS, OLDFIELD. On Neotropical bats of the genus *Eptesicus*. Ann. and Mag. Nat. Hist., ser. 9, vol. 5, pp. 360-367. April, 1920. (New forms: *E. fuscus pelliceus* from Merida, Venezuela; *E. chiriquinus*, Boquete, Chiriquí; *E. montosus*, Highlands of Bolivia; *E. inca*, Cuzco, Peru; *E. punicus*, Puna Island, Gulf of Guayaquil; *E. argentinus*, Goyna, Argentina; and *E. fidelis*, Esperanza, Argentina.)

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- WORTMAN, JACOB L. On some hitherto unrecognized reptilian characters in the skull of the Insectivora and other mammals. Proc. U. S. Nat. Mus., vol. 57, pp. 1-52; figs. 1-16. 1920.
- WROUGHTON, R. C. Change of coat in the common palm squirrel—an appeal. Journ. Bombay Nat. Hist. Soc., vol. 26, pp. 727-728. October 20, 1919.
- WROUGHTON, R. C. On the genus *Tadarida* (wrinkle-lip bats). Journ. Bombay Nat. Hist. Soc., vol. 26, pp. 731-733. October 20, 1919.
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CORRESPONDENCE

A WORK ON THE COMPARATIVE OSTEOLOGY OF THE PROCYONIDÆ

Editor Journal of Mammalogy:

If your space will admit of it, I should like to invite the attention of the readers of the Journal of Mammalogy, and all others interested in the morphology of American mammals, to a work I completed several years ago on the "Comparative Osteology of the *Procyonidæ*." This memoir is complete and in all respects ready to go to the printers and engravers for publication. It consists of 122 type-written pages of matter, carrying 87 figures on 13 plates, and 7 text cuts; the figures are of natural size, and the work when printed will be a royal quarto. All of the skeletons of the procyonine mammals of the world are thus illustrated, including the Panda (*Ælurus fulgens*). The photographs are made direct from the specimens by the author, and taken on several views. The taxonomy of this interesting family of mammals is presented, and many of the osteological characters are tabulated. Most of the material was loaned from the Division of Mammals of the United States National Museum; so that when the memoir is published, the skeletons described will be accessible to a great body of students and mammalogists.

Just prior to the present war, a well known publishing house in Washington, D. C., offered to publish this work for \$670, which insured one thousand (1000) copies, heavy paper covers, and finest material in the market in the way of paper and binding. This opportunity was lost. It can now be gotten out by the same house for about \$1100, and it is quite likely that better and more reasonable terms can be made. The Elizabeth Thompson Fund of Harvard University has started a plan to publish it by allotting a bequest of \$200, provided the balance can be raised within a year. The President of the American Association for the Advancement of Science has led me to hope that \$100 more may be obtained from the \$4000 on hand for such purposes.

My plan is to publish this memoir through subscriptions from individuals and institutions, much after the same plan as the writings of Garrod and of Forbes were published by the Zoölogical Society of London. Any one subscrib-

ing \$2.00 towards the fund to publish the work, will receive, carriage prepaid, one copy, or several copies at two dollars each; the same arrangement can be made with libraries. Then, for the sake of the advancement of the science of mammalogy, a certain number of patrons may offer larger sums.

When the entire amount is raised, the undersigned will take over the matter of publication, and the distribution of the copies when delivered to him by the publishers. There will also be published, following the preface to the memoir, a complete list of the patrons, subscribers, and others who have made it possible to issue the work.

Those who intend to assist in a pecuniary way in this project, may communicate with the undersigned. No subscriptions need be forwarded until it is announced that the entire sum has been promised.

Very truly,

R. W. Shufeldt.

28th April, 1920.

EDITORIAL COMMENT

It has been decided to include five numbers in volume 1 of the Journal of Mammalogy, in order that succeeding volumes may run through a single calendar year. The November, 1920, issue will therefore be included in this volume, and the second volume will begin with the number for February, 1921. The actual date of publication of the May number was June 19, 1920.

We learn from Dr. Joseph Grinnell that Mr. Joseph Dixon, economic mammalogist on the staff of the California Museum of Vertebrate Zoology, is carrying on a special investigation upon the fur-bearing mammals of California. Much of the past winter has been spent in the field, interviewing trappers, searching out dens, and getting photographs illustrative of the natural history of the animals. Such an investigation has been deemed desirable because the real economic status of several of the species is at present in doubt, because the amount of the annual catch which may be taken safely without endangering the breeding stock is not known, and because adequate legislation is needed under which the fur resources of the state can be protected and developed. It is planned to publish, as a contribution from the Museum of Vertebrate Zoology, an extended report upon the fur bearers of California.

To those who have experienced the delights of mammal trapping, the pleasures of forming a collection of these interesting and beautiful creatures, and the fascinations of the study of mammalian structure and habits, the question doubtless frequently comes: Why are not more young people attracted to the study of mammals? There have always been many young ornithologists and entomologists, but comparatively few beginners in natural history have taken seriously to the forming of a collection of mammals. This is doubtless in a measure due to the fact that birds and insects first attract the eye; they are everywhere to be seen, and their great variety draws the attention of the youthful naturalist. But it is also due to the fact that there is more incentive for their study—others are doing that very thing and men, young and old, are mak-

ing collections and exchanging specimens. No one doubts, for instance, the great stimulating effect on the development of ornithologists of the old "egg catalogues" and price lists on the basis of which the eggs and skins of birds were exchanged by those growing naturalists who came within their influence. Some of our leading ornithologists were led into the work by their introduction to those old egg lists and the small journals which contained the offers of exchange.

The successful zoologist of mature years will almost invariably confess that his interest in his first private collection led him to continue as a life work the study of some branch of zoology. The opportunities which presented themselves in early professional life may have influenced his career and led him away from the group of animals most favored in his younger days, but it was his "collection" and the fascination that grew out of his work upon it, that made him a naturalist for life. For this reason most zoologists believe in and encourage the careful formation of small natural history collections by boys. Out of a reasonable number of youthful "collectors" is almost sure to develop one zoologist of ability; and in no other way, many men believe, can eminent and successful zoologists be made. Successful business men who formerly "collected" make sometimes the best patrons of science in their affluent age.

It is the opinion of several of our most prominent members with whom the editor has consulted, that the Society has a genuine function to perform in the encouragement of young mammalogists. And how better do it than by the development of an interest in mammal collecting? Most of the stock arguments against the youthful collecting of birds and eggs can hardly be brought out and used against the collecting of mammals. The trapping of wild mice, ground squirrels, gophers, and other small mammals in such numbers as is usual by a mammal collector can not possibly do harm. Many of the species are already warred against by the agriculturist; and the larger game and fur bearing species are protected by law, with open seasons in which reasonable collecting may be done. Special permits are rarely necessary, and the rigid laws now blocking the growth of young ornithologists will not hamper the collector of mammals. A hundred or more private collections of mammals should flourish in the United States and Canada, where there are now less than a dozen. We have a very few advanced private collectors but these few would doubtless all be glad of a widened interest and would welcome the opportunity for the exchange of specimens with persons of similar tastes in other parts of our continent.

Mr. A. Brazier Howell, with the collaboration of other California mammalogists, has prepared a manuscript list of the mammals of that state with exchange values, which he has submitted to the editor of the Journal for an expression of opinion. By an ingenious system of unit values, 100 percent for a well made skin with perfect uncleaned skull, and a reduction or addition of a certain percent of basic valuation for skins without skulls, odd skulls, specimens with damaged skulls, topotypes, cleaned skulls, or alcoholics, the exchange value of any specimen of any species is readily ascertained from the list. The basic values range from 50 cents for the most abundant forms of *Peromyscus*, 75 cents and up for *Microtus*, \$1.00 and up for *Neotoma*, *Thomomys*, *Dipodomys*, etc., \$1.50 and up for *Sciurus* and species of similar size, on up to \$100 or more for some of the largest ungulates and expensive fur-bearers.

Mr. Howell suggests the preparation of a list with exchange values of all the North American mammals, based upon this plan. The editor believes it is a good idea, several prominent mammalogists have heartily endorsed the scheme, and the opinions of others are solicited. The list should be prepared through the coöperation of all the owners of private collections, simply as a guide in the making of exchanges. It need not be an official publication of the Society or in any way closely connected with it, but no possible harm can come from it and a little encouragement from members may induce some of our advanced private collectors to go ahead with its preparation.

No one can now say how much the future of mammalogy may be advanced by a few good men who may be developed from among the young naturalists who will be awakened and influenced by the existence of a such a list.

—N. H.

THE SECOND ANNUAL MEETING OF THE AMERICAN SOCIETY OF MAMMALOGISTS

The second annual stated meeting of the American Society of Mammalogists, held in New York City, May 3-5, 1920, was attended by about 70 members and was an exceptionally interesting and active scientific gathering. The sessions for business and presentation of papers were held in the American Museum of Natural History. The papers covered a broad field of mammalogical subjects. The only noticeable drawback during the entire meeting was the lack of time for discussion, due to the crowded program. Doctors Beebe and Porsild were unable to be present and their papers were read by title.

MONDAY, MAY 3

Morning Session, 10:00 a.m.

1. Modern methods of mammalogical field work. Vernon Bailey. Twenty-five minutes. Illustrated with apparatus.
2. Notes on the howling monkeys and other mammals from British Guiana. William Beebe. Twenty minutes. Illustrated with lantern slides.
3. Fetuses of the Guiana howling monkey. Adolph H. Schultz. Twenty minutes. Illustrated with lantern slides.
4. Some life histories of African mammals gathered during the Congo Expedition. H. Lang. Forty minutes. Illustrated with lantern slides.
5. Blue-fox farming and the maintenance of the fur supply. Ned Dearborn. Thirty minutes.

Afternoon Session, 2:00 p.m.

6. Resemblances and contrasts between zoologic and palaeontologic research in mammalogy. Desirability of uniform standards and systems in classification, in description, in measurement, in reasoning. Henry Fairfield Osborn. Fifteen minutes.
7. On the history of the gray squirrel. Ernest Thompson Seton. Thirty minutes.
8. The Roosevelt Wild Life Forest Experiment Station. Charles C. Adams. Ten minutes.

Business Session, 3:00 p.m.

Evening Session, 8:00 p.m.

9. Notes on the sea-lion (*Otaria jubata*) of the Peruvian coast. Robert Cushman Murphy. Thirty minutes. Illustrated with lantern slides and motion pictures.
10. Preliminary results of the Second Asiatic Expedition to China and Mongolia. Roy Chapman Andrews. One hour. Illustrated with lantern slides and motion pictures.

TUESDAY, MAY 4

Morning Session, 10:00 a.m.

11. The mammals of Jamaica. H. E. Anthony. Thirty minutes. Illustrated with lantern slides.
12. The Calvert Miocene Formation and some of its mammals. William Palmer. Thirty minutes. Illustrated with lantern slides.
13. On some early states in the evolution of mammalian dentition. William K. Gregory. Forty minutes. Illustrated with lantern slides.
14. Some scattered observations about narwhals. Morton P. Porsild. Ten minutes.
15. Beginnings of the placental mammals. W. D. Matthew. Twenty-five minutes. Illustrated with lantern slides.

Afternoon Session, 2:00 p.m.

16. A dissection of a pigmy sperm whale (*Kogia*). C. L. Camp and J. P. Chapin. Fifteen minutes. Illustrated with lantern slides.
17. (a) Notes on New England cetaceans.
(b) Bison remains in New England.
(c) Exhibition of specimens of *Myotragus*, the remarkable Pleistocene goat of the Balearic Islands. Glover M. Allen. Twenty-five minutes. Illustrated with photographs and specimens.
18. Notes on the mammals of Mount Rainier, Washington. Walter P. Taylor. Thirty minutes. Illustrated with lantern slides.
19. The fate of the European Bison. T. S. Palmer. Twenty minutes.
20. Saving the Yellowstone elk herd. E. W. Nelson. Twenty minutes. Illustrated with lantern slides.

WEDNESDAY, MAY 5

Members of the Society met at the American Museum of Natural History at 9:30 in the morning and were escorted to the New York Zoological Park by Dr. W. T. Hornaday, Director of the Park. A tour of inspection of the excellent collections in the Park was made under the personal guidance of Doctor Hornaday and his able assistants, at the close of which the [members were delightfully entertained at luncheon as the guests of the New York Zoological Society.

—H. H. T. Jackson.

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Names of life members are marked with an asterisk.

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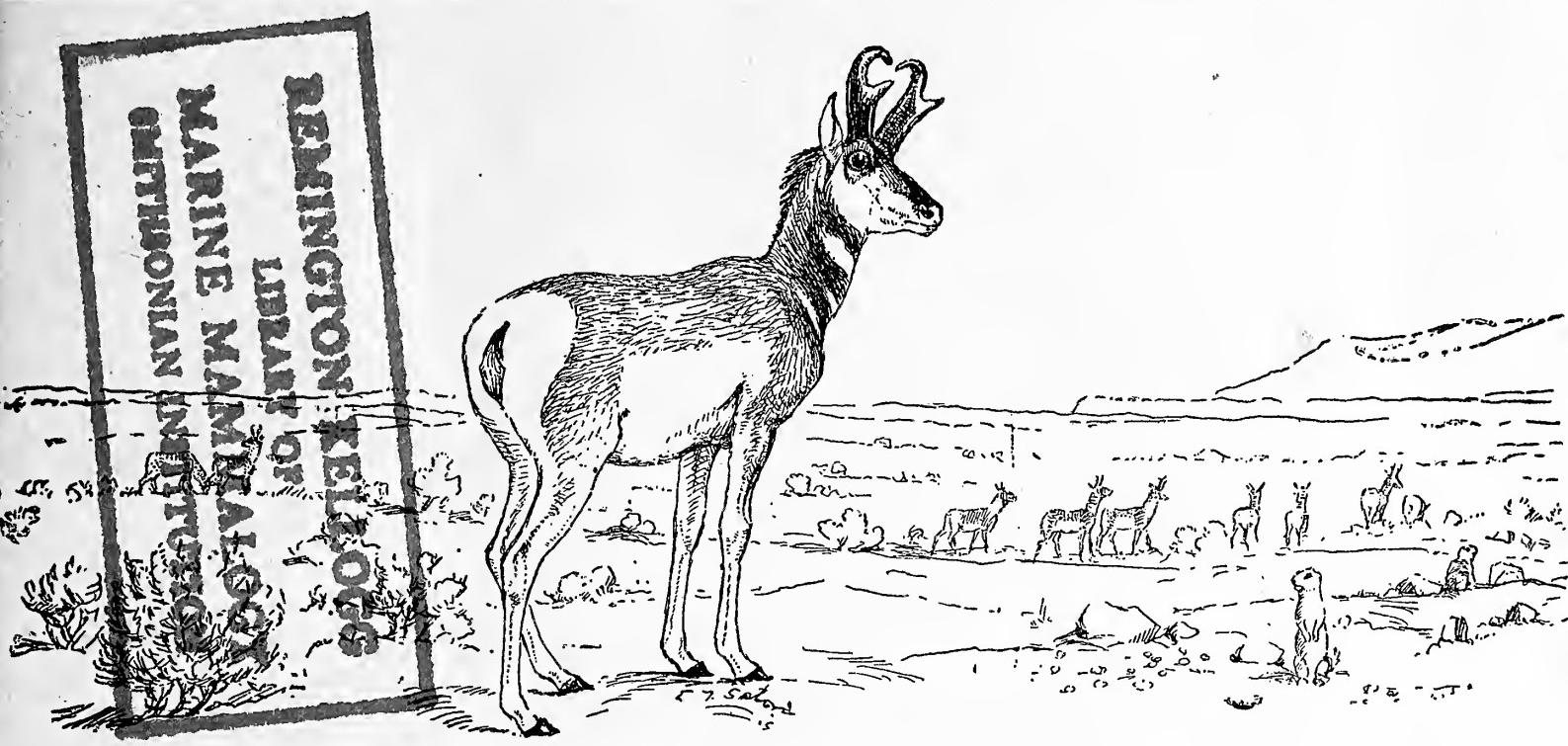
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NOTES ON HEUDE'S BEARS IN THE SIKAWEI MUSEUM, AND ON THE BEARS OF PALÆARCTIC EASTERN ASIA

By ARTHUR DE CARLE SOWERBY, F.R.G.S., F.Z.S.

Since the publication in 1897 to 1901 of Père Heude's "Memoires concernant l'Histoire Naturelle de l'Empire Chinois" there has been considerable confusion in regard to the status of many of the species of mammals that he named or described. His views on the classification of animals were such as to lead the worthy naturalist to name and describe a great many species upon such slender grounds, that he produced a state of confusion bordering on chaos in the orders and families he touched. Often he published bare names without any descriptions, or at best with fragmentary illustrations.

Thus it comes about that mammalogists have experienced considerable difficulty in satisfactorily determining the status of the Chinese species of the genera *Sus*, *Nemorhædus*, *Urotragus*, and *Ursus*, as well as of the members of the family *Cervidæ*. Through the courtesy of the Jesuit Fathers in charge of the famous Sikawei Museum, Si-ka-wei, Shanghai, I was able in 1915 to examine much of the material upon which Heude based his names and descriptions, and so to determine with, I think, some degree of accuracy the status of the species concerned belonging to the genera and family mentioned. The results, in part, were published in a paper "On Heude's Collection of Pigs, Sika, Serows, and Gorals in the Sikawei Museum, Shanghai," in the *Proceedings of the Zoological Society of London*, April, 1917, pp. 7-26.

The present paper deals with the various species of bears found in China and neighboring eastern Asia, and is based on the examination of various skulls in the Sikawei Museum, in the Smithsonian Institution, and in my own collection.

Lest the aims of the founder and of the present proprietors of the Sikawei Museum should continue to be misunderstood, as it would seem they have been in the past, the present opportunity may be taken to state that this institution is intended to be a working museum, where good and useful scientific research may be carried out in the various branches of natural history that come within its sphere of influence. It is not merely a show place, as are so many of the museums founded and maintained by missionary societies in China. This accounts for the fact that the proprietors are reported to have refused all offers of purchase tendered by European or American museums.

Heude passed away in the midst of his labor and his work has never been completed, though Père Courtois, his successor and present curator of the museum, has attempted in the fifth volume of the *Mémoires*, published after Heude's death, to clear up the vexed question of the status of the Chinese, Japanese, and Manchurian bears. The conclusions he arrives at do not agree entirely with my own, notably in regard to Heude's *Ursus leuconyx* and Lydekker's *U. arctos yessoensis*, both of which in my opinion he places in the wrong groups or genera.

Doubtless had Heude lived to complete his work—if such work can ever be considered complete—he would have modified his views to a large extent, and reduced the number of names of species that he created.

It is to be hoped that the present attempt to clear up the subject of the names of the bears of eastern Asia, and of China in particular, will meet with the approval of the proprietors of the Sikawei Museum, without whose permission to go over and study the material it contains, nothing short of extended and costly explorations in the field could have enabled mammalogists of Europe and America to understand the species under discussion.

In the family *Ursidæ* comparatively little has been done in China, and but little is known of the bears that occur there. Although ancient Chinese writings and pictures give evidence that bears once occurred in various places, while the natives preserve semi-mythical accounts of what they call *Kou-hsüng*, *Jên-hsüng*, and *Ma-hsüng*, or dog-bears, man-bears, and horse-bears, occurring in many of the wilder parts of the country, it is probable that these animals have not been known in the greater part of Chihli, Shansi, North Shensi, Shantung, and northern and eastern Kansu for a considerable period of time, probably for centuries.

The writer has received persistent and fairly reliable reports of the occurrence of bears in the Tung Ling (Eastern Tombs) area to the

north-east of Peking in Chihli, where high, forested mountains occur. Swinhoe reported having seen bears in the hills of the Shantung Promontory. Bears undoubtedly occur in western Honan, north-western Hupeh, southern Shensi, and southern and western Kansu. They also occur in Ssü-chuan (Szechuan), and the maritime provinces of Chekiang and Fokien; while they are positively numerous in the forests of Manchuria and north-eastern Corea. In the islands off the east Asiatic coast they are known from Great Shantar Island, in the Okhotsk Sea, near the mouth of the Amur, from Saghalin, Yezo, Japan, Formosa, and Hainan Island.

It is only to be expected that in so large and varied an area a number of different species occur. But few specimens, however, have reached European or American museums, so that Heude's collection of skulls is of peculiar interest and importance, and their proper examination throws much light upon this hitherto imperfectly understood subject.

Representing the *Ursidae* there are in the Sikawei Museum some twelve skulls from various localities as follows:—

1. A skull labelled *Selenarctos leuconyx* from the "montagnes de Pao-ki (Chensi boreal), 1886, Mars, Mgr. Vidi."

N.B. Pao-ki, or Pao-chi, is not in North Shensi, as Heude seems to have supposed, but lies to the west of Si-an Fu, south of the Wei River, at the foot of the great mountain system known as the Tai-pei Shan, in the Ching Ling range, where the late Mr. Malcolm P. Anderson discovered the famous Chinese takin (*Budorcas bedfordi* Thos.).

2. Two skulls from Hakodate (Yedo, Yezo, or Jeso), north Japan.
3. A skull from Moupin (N. W. Ssü-Chuan and Tibet.)
4. An immature skull from the Ussuri region.
5. An immature skull labelled Kamschatka.
6. A skull labelled "bought from a pedlar of bric-a-brac in Chang-hai (Shanghai), Malaisie?" with *Selenarctos* written on the skull itself.
7. A skull from Vladivostok.
8. A skull from the "District de Behring."
9. Three skulls of the Malayan bear, labelled "*Helarctos*."

I could not find the skulls of Heude's *U. melanarctos* or *Melanarctos cavifrons*, and so was forced to make use of the figures in his plates for these.

In making my examination of these specimens I had with me three skulls and photographs of a fourth for comparison. One of these skulls was that of a female black bear from the Himalayas, shot by Captain H. L. Haughton of the 36th Sikhs, who gave it to me when

he was in Tientsin with his regiment. The other two skulls were of a fully adult male and a fully adult female of the Manchurian black bear, secured by me in the forests of North Kirin, I-mien-p'o district (near Ninguta); while the photograph was of the skull of a large grizzly-like bear shot by me in the same district.

After a careful examination of the skulls I had at my disposal, and a comparison of these with the figures in Heude's *Mémoires* and Courtois' note, and with due reference to other literature on the subject, I come to the conclusion that the bears of the regions under discussion are divisible into several generic groups, but three of which directly concern us here. These are:

1. *Selenarctos* HEUDE (= *Arcticonus* Pocock).
Type. *Ursus thibetanus* Cuv.
2. *Ursus* LINNÆUS (= *Ursarctos* Heude).
Type. *Ursus arctos* Linnæus.
3. *Spelæus* BROOKES (= *Danis* Gray, and Pocock;
Spelæarctos E. Geoffroy; and *Melanarctos* Heude).
Type. *Ursus spelæus* Rosenmüller.

In thus dividing the bears of these regions that were formerly all placed in the one genus *Ursus* into three genera, I am conforming to the tendencies of modern systematists, and am bringing these groups into line with *Thalarctos*, the polar bear; *Euarctos*, the North American black bear; *Tremarctos*, the South American spectacled bear; *Melursus*, the Indian sloth-bear; and *Helarctos*, the Malayan sun bear.

As a matter of fact Mr. R. I. Pocock,¹ has preceded me in this form of classification, but his *Arcticonus* is, unfortunately, synonymous with Heude's much earlier *Selenarctos* for the bears of the *Ursus thibetanus* group; while his revival of Gray's *Danis* for the group to which the grizzlies belong cannot stand, since that name was first used by Fabricius for a genus of insects in 1808, and so was preoccupied, Gray having applied it to the grizzlies in 1825.

I. *Selenarctos* Heude, 1901

Mémoires concernant l'Histoire Naturelle de l'Empire Chinois, vol. V, p. 2, 1901.

Type:—*Ursus thibetanus* Cuvier.

The bears in this genus belong to the Himalayan black bear, *Ursus thibetanus* Cuv., group, and are characterized by having a pure black

¹ See R. I. Pocock's valuable papers on this subject in the P. Z. S., 1914, pp. 889–941; Ann. Mag. Nat. Hist., ser. 8, vol. XX, pp. 128–130, 1917; and ibid., ser. 9, vol. I, pp. 375–384, 1918.

pelage, with a conspicuous white crescentic collar on the chest, often also with a white chin; long, rounded ears; longish hair; and the plantar and carpal pads joined together, but separate from the digital pads.

It contains the species: *Selenarctos thibetanus* (Cuv.) (= *U. torquatus* Blanford), *S. mupinensis* Heude, *S. macneilli* (Lydekker), *S. ussuricus* Heude, *S. japonicus* (Schlegel), and *S. formosanus* (Swinhoe), as well as the black bears from Chekiang, Fukien, and Hainan Island.

The skulls I examined belonging to this group were No. 2, the two skulls from Hakodate, No. 4, the Ussuri skull, No. 5, the skull labelled Kamschatka, No. 6, the skull bought from the Shanghai pedlar, my own two skulls from Manchuria, one of which, the male, I subsequently sent to the Smithsonian Institution, and the one given me by Captain Haughton from the Himalayas, altogether nine skulls from seven localities. Both Heude and Courtois wrongly classed the species *leuconyx* Heude, from Shensi with this genus. It rightly belongs to *Ursus*, and so the skull representing it cannot be considered here.

In creating the genus *Selenarctos* Heude paid no attention to the South American genus *Tremarctos*, in which Pocock for sometime included the bears of the *thibetanus* group, after having separated them from *Ursus* on their external characters. The latter authority, however, in his recent paper in the *Annals and Magazine of Natural History*, series 8, vol. 20, p. 129, 1917, has at last separated, under the name *Arcticonus*, the *thibetanus* group from *Tremarctos*, basing this separation on cranial characters—*Tremarctos* having a much shorter skull than the bears of the *thibetanus* group—, and remarking that there are probably differences in the feet and nose which will be revealed when fresh specimens can be examined.

There is no doubt that Heude meant the bears of the *thibetanus* group when he created the new generic name *Selenarctos*, for he specifically mentioned Cuvier's *Ursus thibetanus*, and enumerated others, *mupinensis*, *ussuricus*, and *japonicus*, as species which were commonly confused with it, being of a black pelage with the white crescent on the chest. The name *Selenarctos* therefore takes precedence over *Arcticonus*, and as first reviser of the group I select Cuvier's *Ursus thibetanus* as the type of *Selenarctos*, Heude having failed to choose one.

Taking the skulls of the bears of this group that I examined, I found that the one bought in Shanghai (No. 6.) bore a close resemblance to that of the male bear from Kirin, but was narrower throughout, especially across the forehead; while the posterior molar in the upper jaw was very much smaller than that of the latter (25 mm. x 14.5 mm.

as compared with 30 mm. x 16 mm.). In this respect it came nearest to the Himalayan skull, in which the same tooth was 24 mm. x 14.5 mm. On the other hand the Himalayan skull was broader, proportionately, than the Kirin one, so that this skull could hardly belong to *thibetanus* (erroneously known as *torquatus* Blanford). Taking all the facts into consideration this skull probably came from Chekiang or Fokien, and represents an undescribed species, but since this cannot be proved it is unprofitable to discuss the specimen further.

1. *Selenarctos thibetanus* (Cuvier)

Ursus thibetanus CUVIER, Mam., 1824, pl. 213.

Ursus torquatus BLANFORD, S. S. S., II, 1841, p. 144, pl. 141 D.

Type locality:—"Sylket and Nepal."

That Wagner was wrong in substituting Blanford's name *torquatus*² for Cuvier's *thibetanus* on the grounds that it was a misnomer because "Sylket and Nepal" are not in Tibet is evident. Such a procedure does not conform with those laid down in the International Code. Since, then, the same species extends from Nepal right through the Himalayas, its name must be *thibetanus*, and Blanford's *torquatus* becomes a synonym.

The chief point of difference between this and the next species, *mupinensis* Heude, lies in the size of the posterior molar in the upper jaw. This tooth in the Himalayan specimen measured 24 mm. x 14.5 mm., and in the Moupin skull (a male) 28 mm. x 15.5. Of course the difference in the sex has something to do with this, but, judging from what occurs in the other species, it does not fully account for the difference in the teeth. It will be noticed that the upper posterior molar of *thibetanus* is very much narrower than in *ussuricus*.

Following are measurements of the skull of the female black bear from the Himalayas:—

	Inches
Greatest length.....	11.0
Greatest width.....	7.5
Inter-orbital space.....	2.94
Greatest width of cranium.....	4.25
Greatest depth of cranium.....	3.87
Width of palate.....	1.75
Depth of muzzle.....	2.38
Width of muzzle.....	2.5
Length of lower jaw.....	7.75
Depth of lower jaw at posterior molar.....	1.75
Depth of lower jaw at angle.....	4.5

² Schreber's *Saügth.*, Suppl. Vol. II, p. 144, 1841.

	<i>mm.</i>
Length of upper posterior molar.....	24.0
Width of same.....	14.5

These measurements show that the Himalayan black bear has a wider and deeper skull than the Manchurian form, and wider than the Moupin form, though the muzzle and palate are narrower. The lower jaw is very much heavier, but has smaller teeth. Another noticeable feature is that the cranial outline of the Himalayan form is more convex, dorsally, than that of the Manchurian form. In external characters the two species *thibetanus* and *ussuricus* are much alike, except that the latter seems to have longer hair on the sides of the head and neck.

The very small size of the upper posterior molar is interesting, as the following table of measurements of this tooth in the various species shows that it increases in size in the species from west to east.

1. Himalayan skull ♀ 24 mm. x 14.5 mm.
2. Moupin skull ♂ 28 mm. x 15.5 mm.
3. Kirin skull ♀ 27 mm. x 15 mm.
4. Kirin skull ♂ 30 mm. x 16 mm.
5. Kamschatka skull (Imm.) 31 mm. x 16 mm.

The Shanghai bought skull, a male, has this tooth measuring 25 mm. x 15 mm., which, allowing for a corresponding difference between male and female in the species to which it belongs, such as exists in *ussuricus*, we must conclude represents a species with an even smaller posterior molar than *thibetanus*.

Habitat:—The range of this bear apparently extends from Nepal, throughout the Himalayas into Southern Tibet.

2. *Selenarctos mupinensis* Heude

Selenarctos mupinensis, HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. V, p. 2, pl. II, figs. 1, 2, 9, 1901.

Type:—An adult male in the Sikawei Museum, Shanghai.

Type locality:—Moupin (N. W. Ssü-chuan and E. Tibet).

There can be little doubt that the black bear from Moupin is distinct from the Himalayan form on the one hand and the Manchurian form on the other. Its skull is narrower than in *thibetanus*, the same or slightly broader than in *ussuricus*; while the upper posterior molar is larger than in *thibetanus* and smaller than in *ussuricus*.

Habitat:—The range of this species appears to be N. W. Ssü-chuan, S. W. Kausu, and E. Tibet.

3. *Selenarctos macneilli* (Lydekker)

Ursus torquatus macneilli LYDEKKER, Proc. Zool. Soc. Lond., 1909, pp. 607-610.
Type locality:—Ta-chien-lu, W. Ssü-chuan.

There was no specimen of the black bear from western Ssü-chuan in the Sikawei Museum with which to compare those from other parts, but from Lydekker's description of it it would appear to be very distinct. The latter states that this species has smaller cheek teeth than the Himalayan species, and also a broader skull. It thus cannot be placed with *mupinensis*, in spite of the fact that its type locality is so close to that of the latter. It seems to me to represent the black bears that inhabit South Shensi, West Honan, and North-west Hup'eh, as well as Ssü-chuan. In the figure accompanying Lydekker's description the names of the two species from the Himalaya and West Ssü-chuan seem to have been interchanged, or else his description is wrong, and the narrower skull figured really represents his *macneilli*. The latter was further described as having longer and softer hair than *thibetanus*.

Habitat:—The range of this bear is probably from West Ssü-chuan, eastward to West Honan and North-west Hup'eh, and north into South Shensi.

4. *Selenarctos ussuricus* Heude

Selenarctos ussuricus HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. V, p. 2, pl. II, fig. 10, 1901.

Type:—An immature skull in the Sikawei Museum, Shanghai.

Type locality:—The Ussuri, Eastern Manchuria.

In the immature skull, supposed to be from Kamschatka, the upper posterior molar was 31 mm. in length, while in the Ussuri specimen, a much younger one, and probably a female, the same tooth was only 25 mm. in length. In my specimens from Kirin this tooth was 27 mm. in the female, and 30 mm. in the male. As none of the skulls from other districts showed this tooth to be larger than 28 mm. (i.e., in the male from Moupin), it appears that the large size of this tooth is characteristic of the Manchurian species. Another distinguishing feature is the proportionate narrowness of the skull.

From a comparison of the skulls from Kirin, the Ussuri, and Kamschatka, I do not hesitate to class them together as representing one species, and since Heude has given the name *ussuricus*, accompanied with a figure (upper molar tooth row), though without a description, this name must stand.

This is unfortunate, for the type specimen is a poor one, though, taking into consideration its age, it shows the main distinguishing characters in the skull of the species.

In order to show this more clearly, and to remove any possibility of doubt as regards the distinctness of the Manchurian black bear from any of the more westerly forms, I give the following description and measurements of a fully adult female from the I-mien-p'o district of North Kirin, whose skin and skull now lie in the Smithsonian Institution at Washington.

Adult ♀. U. S. Nat. Mus. No. 199684. Collector's number, 723. Locality, 20 miles north of I-mien-po, N. Kirin, Manchuria. Alt. 700 ft. Shot October 10th, 1914. Presented to the United States National Museum by Mr. R. S. Clark.

Measurements in the flesh:—Length of head and body, 60 inches; tail, 2.4 inches; hind foot (s. u.), 7.9 inches; ear, 6 inches.

Color:—Pure black, with well defined white, crescentic collar on the chest, extending to the forepart of the shoulder; chin white.

The hair is long and soft, increasing in length on the sides of the neck and head to about 8 inches, giving the appearance of a fine mane.

Skull

	<i>Inches</i>
Greatest length.....	11.83
Greatest width.....	7.25
Inter-orbital space.....	2.88
Greatest width of cranium.....	4.0
Greatest depth of cranium.....	3.5
Width of palate.....	1.82
Depth of muzzle.....	2.25
Width of muzzle.....	2.62
Length of lower jaw.....	7.62
Depth of lower jaw at posterior molar	1.51
Depth of lower jaw at angle.....	4.25
<i>mm.</i>	
Length of upper posterior molar.....	27.0
Width of upper posterior molar.....	15.0

The dorsal outline of the skull is fairly straight, slightly convex about the cranium. There is a fairly well pronounced parietal ridge (more pronounced in male), and the skull compared with those of other members of the group is narrower than in the Himalayan form, about the same as in the Moupin form, and broader than in the Japanese form.

The teeth, also, especially the canines, and the upper posterior molar, are larger than in the other forms.

Habitat:—The range of this species probably extends from western Manchuria (W. Heilungkiang Province) throughout the forested areas of that country, eastward to the Primorsk, north-eastward into Kams-

chatka,³ and southward into North Corea. Its northern limit does not appear to have been determined, but it extends at least into the Amur country, though Schrenck did not record it in his great work on that region.

5. *Selenarctos japonicus* (Schlegel)

Ursus japonicus, SCHLEGEL, Handl. Beauf. Dierk. I, p. 42, 1857.

Selenarctos japonicus (Schlegel) HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. II, p. 2, pl. II, figs. 5, 6, & 7, 1901.

Type locality:—Japanese Islands.

Heude figures in his *Mémoires*, the skull of a bear from Japan, which he refers to Schlegel's *japonicus*. This undoubtedly represents the Japanese black bear, at once distinguishable from the mainland forms of *Selenarctos* by the extreme (for the genus) narrowness of the skull. In this it approaches the *Ursus* group, and is so like the skull labelled *leuconyx* from Pao-chi, Shensi, that Heude and Courtois both classed the latter with *Selenarctos*. A more careful examination of the respective skulls revealed the fact that the *leuconyx* one was longer in the muzzle, and really belonged to *Ursus*.

It is interesting to note that the broadest skulls in this group, with the exception of that of *Selenarctos formosanus* (Swinh.) our next species, which is broader than any other, occur in the extreme west of the known range of the genus, and the narrowest in the extreme east, the intermediate forms, *mupinensis*, and *ussuricus* being intermediate in this respect.

As regards the color and external characters Sclater (*P. Z. S.*, 1862, p. 261) wrote concerning some bears of this species in the London Zoological Gardens at the time:

Our specimens, the largest of which must be nearly full grown. . . . are barely two thirds the size of *Ursus torquatus*. The very distinct white gular band of *Ursus torquatus* is only represented in *Ursus japonicus* by a slight undefined whitish line, which seems likely to wholly disappear. The muzzle is also much blacker in *U. japonicus* than in *U. torquatus*; and instead of the prominent bushy cheeks of *U. torquatus*, the Japanese species appears to have the face clothed only with short hairs, as in *Ursus americanus*.

He also remarks that *S. japonicus* appears to be intermediate between the Himalayan black bear and the American black bear, a fact also born out by the skull of *S. japonicus*.

Habitat:—The Japanese Islands.

³ Corroborative evidence of the existence of this type of bear in Kamschatka is lacking.

6. *Selenarctos formosanus* (Swinhoe)

Ursus formosanus SWINHOE, Proc. Zool. Soc. Lond., 1864, p. 380.

Ursus torquatus formosanus (Sw.) LYDEKKER, Proc. Zool. Soc. Lond., 1909, pp. 607–610, fig. p. 608, c.

Type locality:—Formosa.

This species was first named by Swinhoe, who however gave very meagre details. In 1909 Lydekker gave a figure of a skull of the Formosan black bear, and confirmed Swinhoe's diagnosis of it as distinct from any of the other known forms. Its chief characteristics are its shorter and broader skull, and its broad and short last molar. It thus approaches to the skull in Sikawei Museum that was bought from a pedlar in Shanghai, and to the Himalayan form. Its skull is, however, proportionately shorter and wider than any other known species. Lydekker gives the following measurements: Basal length, 9.1 inches; maximum zygomatic width, 6.95; length of last 3 upper cheek teeth, 2.25.

From the shape and proportions of the skull figured by Lydekker there is no doubt about this form belonging to the genus *Selenarctos*. Swinhoe gave its hair as stiff, and black, and remarked on the presence of a white crescent.

We thus have six recognizable species of *Selenarctos*, and apparently three more unidentified forms, namely: (1) the black bear from Chekiang and Fukien in south-eastern China, a stuffed specimen of which exists in the museum of the North China Branch of the Royal Asiatic Society, Shanghai, the skull unfortunately being inside the specimen, (2) the black bear from Hainan Island, which has been confused with *S. thibetanus* (or *torquatus*), and (3) the black bear that inhabits (but is rapidly becoming extinct) the forested and mountainous country to the north-east of Peking in Chihli, known as the Tung Ling and Imperial Hunting Grounds.

II. *Ursus* Linnæus, 1758

Syst. Nat., Ed. X, I, p. 47, 1758.

Type:—*Ursus arctos* Linnæus. (Scandinavia.)

The bears that belong to what Heude called the *Ursarctos* group, must be placed in the genus *Ursus*, of which *Ursus arctos* of Scandinavia is the type.

These have longer skulls than the members of the *Selenarctos* group, do not have a pronouncedly high forehead, as in *Spelæus* group, and,

as far as is at present known are brown, light buffy-brown, grayish, or whitish in their pelages. There is usually no sign of a white crescentic collar, except sometimes in the very young cubs. The soles of the feet have the plantar and carpal pads cleft across in the hind feet, sometimes with, sometimes without hair in the cleft; while the digital pads are separate. In the forefeet the plantar and carpal pads are separated, the former being reduced to a small round knob. The feet are thus very distinct from those of *Selenarctos*.

The group was represented amongst the skulls I had for comparison by No. 1, labelled *leuconyx* from Pao-chi, Shensi, No. 6, the one from Vladivostok (*mandchuricus*), and No. 7, the one from the Bering region called *beringianus*.

As regards the name *Ursarctos*, it was applied by Heude to the Vladivostok brown bear, *mandchuricus*, and to the Bering skull, the locality of the latter being very vague. Since neither of these can be separated generically, or even subgenerically from true *Ursus*, the name *Ursarctos* cannot be used.

It is in the genus *Ursus* that the greatest confusion seems to reign, due largely to lack of sufficient material from properly identified localities, and to the close connection between this genus and our next, *Spelæus*.

As regards the bears of eastern Asia the following species may for the present be included in the genus *Ursus*:—(1) *Ursus collaris* Cuvier, of Siberia, (2) *U. isabellinus* Horsfield, of the Himalayas, (3) *U. pruinosus*, Blyth, of the Himalayas, (4) *U. lagomyiarius* Sewerzow, of central Asia and north-western China, (5) *U. beringianus* Middendorff, of Great Shantar Island, (6) *U. mandchuricus* Heude, of Manchuria and the Amur, and (7) *U. yesoensis* Lydekker, of Yezo or Hakodate.

Of these it is possible that *U. pruinosus* and *U. lagomyiarius* may be found to be subgenerically, or even generically distinct from *Ursus*, and possibly more closely allied to *Spelæus*; but until more material from all parts can be gathered for comparative purposes this cannot be determined.

7. *Ursus collaris* Cuvier

Ursus collaris CUVIER, Hist. Nat. Mamm., livr. XLIII, 1824.

This apparently is the brown bear of the true *Ursus* group that inhabits Siberia. Trouessart gives its range as the Ural Mountains, Siberia, Batang, and Tengri-Nor. It is generally supposed to range into Kamschatka, but this is open to doubt. It is rather a light brown, with dark brown rings round the eyes.

8. Ursus isabellinus Horsfield

Ursus isabellinus HORSFIELD, Trans. Linn. Soc., vol. XV, p. 322, 1826.
Ursus arctus isabellinus Hors., LYDEKKER, P. Z. S. 1897.

This is the so-called Himalayan snow-bear, or red-bear. It is a very pale form, buffy like *U. syriacus*, from which it differs in having the ears very hairy. It is possible that this species belongs more truly to the cave bears than to the brown bears, and so should be placed in the genus *Spelæus*.

9. Ursus pruinosus Blyth

Ursus pruinosus BLYTH, Journ. Asiatic Soc. Bengal, vol. XXII, p. 589, 1858;
LYDEKKER, P. Z. S., 1897, p. 426, pl. XXVII (colored).
Type locality:—Tibetan Himalayas.

The Himalayan blue-bear, as this species is called, is a small species, with long hair of a white and grey above, merging into blackish on the legs and feet. A good account of it has been given, together with a colored figure, by Lydekker in his paper "The Blue Bear of Tibet, with Notes on the Members of the *Ursus arctus* Group," P. Z. S., pp. 412–426, pl. XXVIII, 1897.

As already suggested this species, together with our next, may prove to be generically, or sub-generically distinct from *Ursus*.

10. Ursus lagomyiarius Sewerzow

Ursus lagomyiarius SEWERZOW, Fauna Turkestan, 1874.
Ursus lagomyarius, Sew. PRZEWALSKI, Reis. Mongol. I, 1876.—Cat. Zool. Coll. of H. M. Przewalski, p. 9, no. 1, 1887, St. Petersburg.

This appears to be a close relation of *Ursus pruinosus*, that occurs in the highlands of central Asia, northern Tibet and possibly north-western China. It is larger than *pruinosus*, however, and apparently less white in color.

Another bear belonging to this group, or at least related to it, is that named *Selenarctos leuconyx* by Heude, a skull and paws of which were sent to him from Pao-chi in West Shensi. The name *leuconyx* had already been used by Severtzow (= Sewerzow) in naming a bear from the Altai (*Ursus leuconyx* Severtzow, Nachr. Ges. Moscou, VIII, 1873, p. 79, pl. II.), but there is nothing to show that Heude meant to refer the Pao-chi specimen to this species. On the contrary he classed it with the *Selenarctos*, or black bear group, which he had separated from *Ursus*.

Since then the Pao-chi form is distinct from Severtzow's *U. leuconyx*, which nevertheless does not seem to belong to the genus *Ursus*, but to *Spelæus*, and since when Heude used the name *leuconyx* it was already preoccupied by a bear at that time placed in the genus *Ursus*, it cannot now be used for the Pao-chi species, although the latter turns out to belong to *Ursus*, while Severtzow's species seems to belong to *Spelæus*.

The Shensi brown-bear (sic) represented solely by the skull from Pao-chi in the Sikawei Museum therefore requires a new name, and since it has been entirely due to the generosity of my friend, Mr. Robert Sterling Clark, that I have been able to carry out my exploration work in China, Mongolia, and Manchuria, I have decided to name this species in his honor. It may thus be known as:

11. *Ursus clarki* nom. nov.

Selenarctos leuconyx HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. V, p. 2, p. II, figs. 3, 4, 8, 1898. (*nom. preoc.*)

Type:—A skull in the Sikawei Museum, Shanghai.

Type locality:—Mountains of Pao-chi (*i.e.* the Tai-pei Shan of the Ching Ling Range.), S. W. Shensi.

In this species the skull is narrow, with rather long muzzle and jaws, and a somewhat convex cranial outline. Heude says that the paws of his specimen, which is the type, are white; and this is all that is known of the color of the species. When I was in this locality I made enquiries concerning the form of the bear inhabiting these mountains, and was told that it was whitish in color with some black about it. Later, when hunting in the mountains of the Tai-pei Shan, I came across evidences of the existence of bears there, but did not see a specimen. The species would seem to represent *U. pruinosus* in this region.

Habitat:—Probably the whole, or greater part of the Ching Ling Range, up to 11,000 ft. or 12,000 ft. altitude.

12. *Ursus mandchuricus* (Heude)

Ursarctos mandchuricus HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. IV, pp. 23–24, pl. VII, figs. 1–1e, 1898.

Type:—A skull in the Sikawei Museum, Shanghai.

Type locality:—The Ussuri region, near Vladivostock, Manchuria.

This is a large mainland brown bear that inhabits the forests of eastern, central (?), and northern Manchuria. I have seen a number

of skins of brown bears from Manchuria, and can say that they are brown, usually a good deal darker than that of *Ursus collaris* Cuv., and are without the brown patch encircling the eye. The color is not so dark as in *U. beringianus* Midd. from Great Shantar Island (not the Bering region), and still less dark than that of *Spelæus piscator* (Puch.) from Kamschatka, with which it and *U. beringianus* might be, and apparently have been confused.

The skull of *U. mandchuricus*, as exemplified by the Sikâwei specimen, is very heavy and rugged, with a fairly straight cranial outline, rising but slightly at the forehead. The muzzle is shorter and broader than in the skulls of the next genus, *Spelæus*, though less deep.

Judging from the size of the skull in the Sikawei Museum the species must be a very large one, a fact also born out by the large size of good Manchurian skins.

Habitat:—The range of this species probably extends from the Ussuri northward and westward, embracing the Amur Valley, and possibly extending into Eastern Siberia and Kamschatka.

13. *Ursus yesoensis* Lydekker

Ursus arctos yesoensis LYDEKKER, Proc. Zool. Soc. Lond., 1897, pp. 422–423, fig.

Type in the British Museum collections.

Type locality:—Hakodate, Yezo.

In 1897 Lydekker described a bear from Hakodate under the name *Ursus arctos yesoensis*, giving a figure of a skull. In 1901 Père Courtois in volume V of the *Mémoires* confused this bear with Heude's *melanarctos*, which belongs to our next group. As Lydekker states distinctly that his *yesoensis* is a brown bear, while Heude states equally emphatically that *melanarctos* is pure and deep black, it is obvious that the two forms are distinct. The skull figured by Lydekker does not agree with the characters of *melanarctos*, and is, in effect that of a true brown bear. It has a very convex cranial outline.

Habitat:—The island of Yezo, N. Japan; possibly also Saghalin Island.

14. *Ursus beringianus* Middendorff

Ursus arctos var. *beringiana* MIDDENDORFF, Reis. im. den äuss. Nord. u. Ost. Sibir., vol. I, pt. II, pl. 1, 1851.

Type locality:—Great Shantar Island.

The skull of the bear from the Bering region in the Sikawei Museum agrees, as far as I could make out, with those of true *Ursus*; but there

was no means of ascertaining whether it represented *U. beringianus* or not. Both Heude and Courtois seem to have considered it to belong to Middendorff's species. Its label marked "District de Behring" suggests that it came from very much further north than Great Shantar Island, which is near the mouth of the Amur, in the South Okhotsk Sea, and is the type locality of *beringianus*. In this case the skull probably belongs to some other form.

U. beringianus is a large, dark brown species, to judge from specimens in the Tring Museum. But at best it can only be considered an island form of the mainland *U. mandchuricus*.

Habitat:—Great Shantar Island.

III. *Spelæus* Brookes, 1828⁴

Cat. Anat. & Zool. Museum of Josh. Brookes, London, 1828.

Type:—*Ursus spelæus* Rosenmüller, (= *Spelæus antiquorum* used by Brookes).

Belonging to this group of bears, to which Heude gave the generic name *Melanarctos*, and which contains the prehistoric cave-bears as well as the recent cave-bears or grizzlies, there are some three species known to occur in eastern Asia, and apparently a fourth in central Asia. These are: (1) *Spelæus melanarctos* (Heude) from Yezo, (2) *S. cavifrons* (Heude) from Manchuria, (3) *S. piscator* (Pucheran) from Kamschatka, and (4) *S. leuconyx* (Severtzow) from the Altai region.

These may be considered the Asiatic representatives of the American grizzlies on the one hand and the extinct European cave-bears on the other.

They are large species, in which the skull is very long and narrow, relatively more so than in *Ursus*, with very high foreheads so that the cranial outline at this point is strongly concave. The cranium itself is very narrow, the muzzle and jaws narrow and deep. The soles of the feet agree very much with those of *Ursus*.

From the general appearance of the skulls of Heude's two species, *S. melanarctos*, and *S. cavifrons*, it is evident that this authority was right in separating these bears from the *Ursus* group. In this connection Mr. Gerrit S. Miller, Jr., referring to a specimen of *cavifrons* secured by me in the Manchurian forests, has written me under date of January 17, 1917, as follows:—

⁴ This name precedes E. Geoffroy's *Spelæarctos*, Rev. Encyclopédique, 59, p. 81, 1833.

Yesterday, in company with Dr. C. Hart Merriam and Mr. James W. Gidley, I compared your skull of Manchurian "*Melanarctos*" (U. S. Nat. Mus. No. 199683) with skulls and teeth of cave bears from the Pyrenees, with the Kamchatkan *Ursus piscator* and the largest grizzlies and brown bears of western North America. We found it impossible to separate these animals by cranial and dental characters into subgeneric groups. Such differences as occur, for instance those distinguishing the extinct Pyrenean bears from living Alaskan species, and those distinguishing your animal from either of these two or from *Ursus piscator*, are no greater than the differences present among various forms now occurring in North America. In other words the characters are merely specific. In its past and present distribution this group of bears resembles some of the lagomorphs and rodents. The genus *Ochotona* ranged west to England in the Pleistocene; it is now confined to Asia and western North America. A Pleistocene *Microtus* of the "*Stenocranius*" group has been found in southern England. The group now ranges from the Altai Mountains to Alaska. Probably there are several other instances of the same kind.

My specimen, referred to by Mr. Miller, is a fine sample of its kind. It was shot by myself in the forest to the north of I-mien-p'o, in Kirin Province, and was sent to the Smithsonian Institution. It and Heude's two specimens of *cavifrons* and *melanarctos* are the only ones of these particular species known to exist in any recognized museum, and are therefore of great importance.

On the question of whether or not this genus is distinct from *Ursus* there seems to me to be little doubt; though it is not quite clear, owing to lack of material for examination, exactly which species belong to which genus.

Pocock has separated the grizzly bears from *Ursus* on the strength of the fact that the skin between the toes extends much further towards the tips in the former than in the latter. He used the name *Danis* Gray (1825), which, as already pointed out, is preoccupied (Fabricius, 1808). Thus Brookes' catalogue name *Spelæus* (1828), based on *Spelæus antiquorum* (= *spelæus*), as the next oldest is the correct one for this group of bears. If, however, as Mr. Miller has pointed out *in litteris*, it should be found that the living 'cave' bears can be separated from their extinct ancestors, then Heude's name *Melanarctos* would be the correct one for the recent group. There seems no way but to accept Brookes' name, in spite of its appearing in a sale catalogue of his collection.

15. *Spelæus melanarctos* (Heude)

Ursus melanarctos HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. IV, pp. 17-18, pl. VIII, figs. 1-1c, & pl. VII, figs. 2-2a, 1898.

Type:—A skull in Sikawei Museum, Shanghai.

Type locality:—Yezo, N. Japan.

This was the first of the two species to be discovered. It occurs in the island of Yezo, where Heude emphatically declares three species of bear occur, namely *melanarctos*, *yosoensis*, and *japonicus*. He distinguishes *melanarctos* as being of an intense black, with no light markings at all. The skull is large and heavy, with a longer and proportionately narrower muzzle than in the true *Ursus* group. The forehead is high, giving the profile of the skull a concave outline. Heude's description is very meagre, and so far as I am aware no other publication on this animal occurs, excepting that in volume V, of the "Mémoires," in which Courtois confuses this bear with Lydekker's *Ursus yosoensis*.

Habitat:—Yezo Island, N. Japan.

16. *Spelæus cavifrons* (Heude)

Melanarctos cavifrons HEUDE, Mém. conc. l'Hist. Nat. de l'Emp. Chin., vol. V, pt. 1, p. 1, pl. I, figs. 6-8, 1901.

Type:—A skull in the Sikawei Museum, Shanghai.

Type locality:—Tçi-tçi Har (Tsi-tsi-har), N. W. Manchuria.

This bear is very distinct from any of the other mainland forms. It is distinguishable from *Ursus mandchuricus*, which it resembles in size, by its high forehead, narrower and deeper muzzle, black pelage, and coarse hair.

While in the I-mien-p'o district of North Kirin, I secured a specimen of a bear which can only be referred to this species. The skull agrees very closely with Heude's figure. As Heude's description is not as full as it might be, I give the following account of my specimen.

Fully adult ♂. U. S. Nat. Mus. No. 199683. Collector's number, 722. Locality, 20 miles north of I-mien-p'o, N. Kirin, Manchuria. Alt. 700 ft. Shot October 8th, 1914. Presented to the United States National Museum by Mr. R. S. Clark.

Measurements in the flesh. Length of head and body, 79 inches; tail, 5.5 inches; hind foot (s. u.), 10.2 inches; ear, 6 inches.

Color: Generally black, merging into brown on the muzzle; brownish on the head; a band of slightly lighter color over the shoulders, owing to hairs being

of a light chestnut color at their bases; no light or white crescent on the chest. The light color across the shoulders is significant as will be shown further on.

Hair very coarse, with little under-wool.

Skull	inches
Greatest length.....	16.0
Greatest width.....	9.25
Inter-orbital space.....	3.47
Greatest width of cranium.....	4.25
Greatest height of parietal ridge.....	1.5
Depth of muzzle.....	3.5
Width of muzzle.....	3.47
Length of lower jaw.....	11.0
Depth of lower jaw at posterior molar.....	2.25
Depth of lower jaw at angle.....	6.75
Width of palate.....	2.5

Teeth: Upper jaw, 3 molars, 2 premolars, 1 canine, and 3 incisors.

Lower jaw, 3 molars, 2 premolars, 1 canine, and 3 incisors.

This bear is a large animal, and owing to its high forehead, and deep muzzle and jaws, of a peculiarly savage appearance. In life the shoulders appear high.

Little is known of the habits of the species. The specimen I shot was very savage and tried repeatedly to attack me after receiving the first shot. The native Russians and Chinese greatly fear this animal, as it has been known to kill and devour hunters. They say it does not hibernate like the black bear. The stomach of my specimens contained nothing but acorns. The animal was estimated to weigh something over 600 lbs., but it was in very poor condition compared with what bears usually are in the autumn. It is known to the Chinese as *Hua Yao-tzu*, meaning 'pied kidneys.'

Habitat:—The range of this species probably extends throughout the forested areas of Manchuria and neighbouring regions. I heard of an animal that answered its description in South Kirin, North Corea, and on the Lower Sungari. Heude's specimen came from Tsi-tsi-har some distance to the north-west of Harbin in the valley of the Nonni Ho, in Dauria.

17. *Spelæus piscator* (Pucheran)

Ursus piscator PUCHERAN, Rev. Zool., 1855, p. 392.

Type:—No type; the species was based on a figure given by I. Geoffroy St. Hilaire in the *Zoology of the Voyage of the Venus*, Mamm. t. 4, as *Ursus arctos* var. du Kamschatka.

Locality:—Kamschatka.

Known as the Kamschatkan fish-bear, this species appears to belong to the cave-bear group rather than to the brown bears. A specimen assigned to this species that used to be in the gardens of the Zoological Society of London, and which I had the opportunity of examining at its death in 1918 reminded me very much of my specimen of *Spelæus cavifrons* in its general appearance. Its hair was softer, however, and of a dark brown color; the ears were full of long hair and were very hairy outside, much as in *U. isabellinus* and *U. pruinosus* of the Himalayas; while the forehead was not markedly high. The specimen was not very large, however, and had been kept in captivity a long time, so that the cranial characters are hardly to be considered. In any case the animal looked very different from typical members of the genus *Ursus*.

In 1867 Gray described a species of bear, *Ursus lasiotus* (*Ann. Nat. Hist. ser. 3. vol. 20, p. 301*) which was brought from China alive, and said to be from the interior of North China. Sclater (*P. Z. S. 1867, p. 818*), however stated that the animal probably belonged to *U. pisator* Pucheran, and from what we know of conditions then, the uncertainty attaching to the given locality of specimens from these parts, and the present distribution of this type of bear, it seems probable that Sclater was right. In any case *U. lasiotus* is unidentifiable at present.

18. *Spelæus leuconyx* (Severtzow)

Ursus leuconyx, SEVERTZOW, Nachr. Ges. Moscou, vol. VIII, p. 79, pl. II, 1873
Type locality:—Altai Region.

This species appears to belong to the grizzlies, since it is described as having light claws, which is said to be characteristic of the latter group of bears. To it I refer some bears shot by the Fenwick Owen party in 1911 on the Kansu-Tibetan border. In spite of their somewhat light color these belong to the same group as the Manchurian *cavifrons*, if the photographs reproduced in Mr. Frank Wallace's book ("Big Game of Central and West China,") and others I have seen of them are to be relied upon. The adult specimens show the same high forehead, deep muzzle and jaws, and what is more significant a distinct light band across the shoulders; which it will be remembered occurs in an incipient form in *cavifrons*.

This also is a large species, and the specimens referred to above were said to be something like *U. pruinosus*. It is this fact, amongst

others, that makes me think it possible that the latter animal, and *U. lagomyiarius*, and possibly also *U. clarki* from the Ching Ling, may ultimately be found to be generically different from true *Ursus*, and possibly referable to *Spelæus*.

NOTES ON WOOD RAT WORK

BY EDWARD R. WARREN

[*Plates 10-11*]

While collecting at Alma, Park County, Colorado, in the autumn of 1914, I discovered some unusually interesting work of the "mountain rat," or Colorado bushy-tailed wood rat, *Neotoma cinerea orolestes*. This was in an old shafthouse on Buckskin Creek, about a mile from the town of Alma. While I have seen much of the work of this and other species of *Neotoma*, in some respects this was very different from any I have seen elsewhere. Whether the work of one or two of the animals I cannot say, though on one visit to the place I saw two.

The principal accumulation was about the shaft, which was toward the corner of the building, opposite the wide door shown in figure 1. This shaft was a two compartment affair, with manway and bucketway, the former open at the top, the latter covered with the usual sloping doors. About the shaft, but principally about the manhole, and even on top of the timbers, were piled many sticks. The pictures perhaps show better what a mass of stuff was there. The manway measured 30 inches square inside; an outside measurement could not be made, but the base of the pile was 48 inches on one side, and 45 inches on the other; the material was piled steeply, and much of it was green aspen leaves and twigs, just the tips of the branches. As these were often piled 12 inches high and 8 inches thick it will easily be seen that considerable labor was involved in gathering so much. While the accumulation was mainly about the manhole, it also extended somewhat along the bucketway, which was the same width, but a trifle longer.

The blacksmith forge in the shafthouse was on the same side of the building as the door previously mentioned, by the window which can be seen both in the picture of the building and in that of the forge. Here were more of the aspen leaves on the forge itself, on a ledge level with it, and on shelves and ledges above, five piles altogether. The

nest was on the topmost ledge. On the ledges with these aspen leaves, which, where thickest, were laid in regular layers, were also pieces of fungus from dead logs. The nest was the usual globular affair made of various fibers.

From an observation I made it seems possible that the leaves and fungus were food supplies for the winter. The following extract from my notebook may be of interest:

When I went into the house the rat was on the ledge where the nest is, but went back into the nest. Did not seem much afraid. A few minutes after, when I was at the shaft, I saw two rats run along a ledge at the other end of the house and out onto the roof. Presently one came back and was fooling on the shelves at that end for several minutes, finally returning to the nest. I watched it climb about on the joists and boards and it seemed to be able to get a foothold almost anywhere. When I was all done with the photographic work and was examining things I stood on the forge and poked the nest with my finger. The rat came out and ran along the ledge, stopped four or five feet from me and apparently forgot all about me, for it began to eat something and fooled around for several minutes. I saw it have one aspen leaf in its mouth and am sure I saw it eat another. It presently came back to the nest while I stood there.

I remark in my notes that it may have been eating some of the fungus before I saw it with the aspen leaf. The altitude of the locality is about 10,300 feet, the winters are long with considerable snow, and foraging must be difficult at that season, so that it behooves a non-hibernating animal to lay in a good supply of food, and the rats seem to have availed themselves of the most convenient and accessible material. Elsewhere I have seen leaves of kinnikinnick brought into buildings and laid away much as the aspen leaves were, but have no evidence they were used as food. As a matter of fact I regarded it as a manifestation of the mania these animals have for carrying about useless articles.

Eight days after my examination of the work I paid another visit to the shafthouse as I was passing by. The pile at the manway appeared to have had additions made to it. Climbing upon the forge I poked the nest and the occupant came out, stopped hardly a foot away from me, and after a moment went back to the nest. When disturbed again it halted for a moment not far away and then went on out over the broken-down roof. A pile of sticks could be seen on the roof at the gallows frame of the shaft; it was inaccessible and could not be examined.



FIG. 1. SHAFTHOUSE, NEAR ALMA, COLO., IN WHICH THE WOOD RAT WORK WAS FOUND

The shaft was opposite the door at right end of house; the forge was by the window at the left. Sticks can be seen on the roof at the gallows frame.



FIG. 2. INTERIOR OF SHAFTHOUSE

Showing forge, with leaves piled on ledges above it, and nest on topmost ledge.

(Warren: Notes on Wood Rat Work.)



FIG. 1. ONE SIDE OF THE SHAFT SHOWING THE STICKS AND LEAVES PILED BY THE RATS

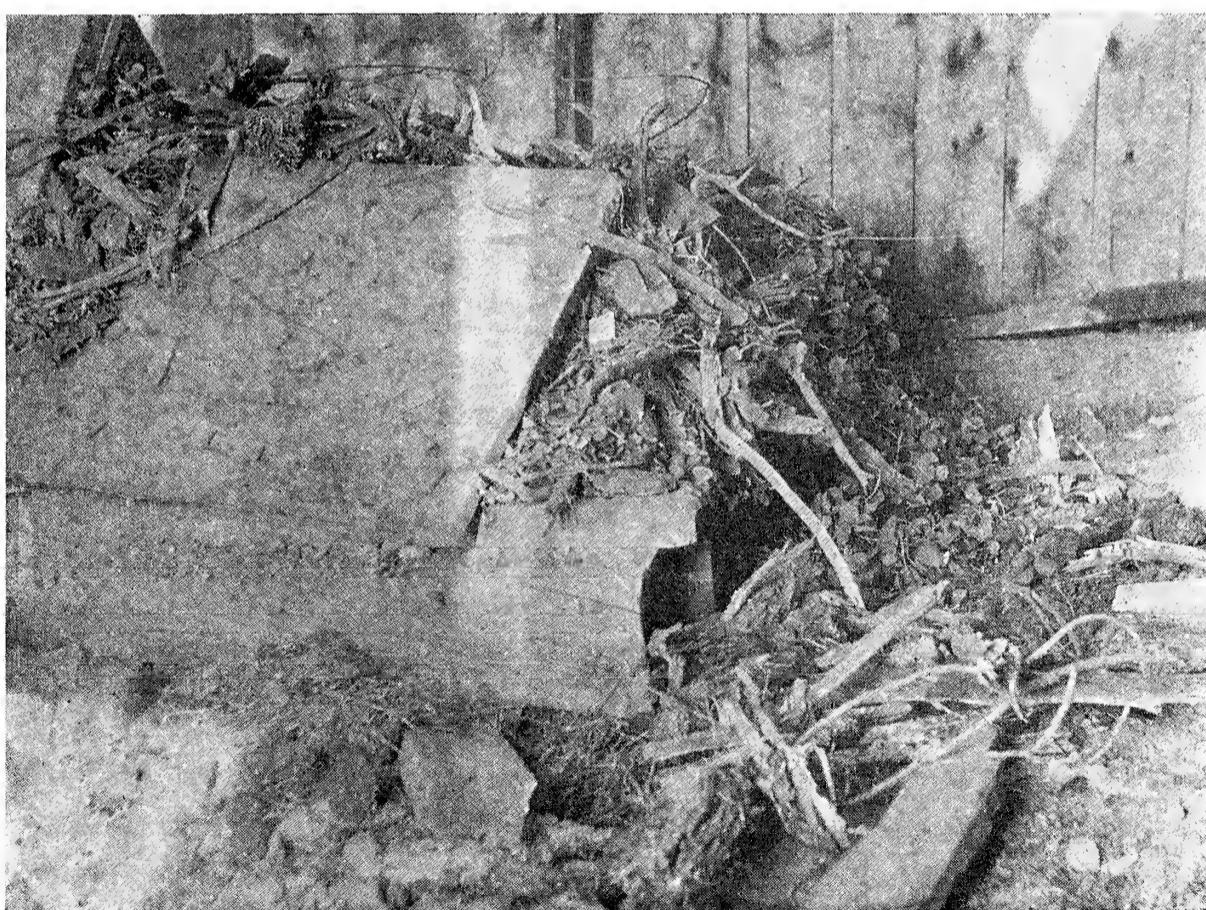


FIG. 2. OPPOSITE END OF SHAFT FROM MANWAY
Aspen leaves are to be seen here, and pine cones on top

(Warren: Notes on Wood Rat Work.)

On this same trip I found in another building, a large log cabin this time, two nests and various piles of sticks, among which were thistles and pieces of rose bushes. In a closet or small room in this house I found aspen leaves piled on the shelves in a manner similar to those in the shafthouse.

At Alma I heard a story of some miners who, having missed several pounds of candles, later found them laid away on a shelf or ledge in or behind the timbers 35 feet down a shaft, where a rat had carried them. As there are six candles to the pound the animal, or animals, went to much trouble for nothing.

AN INSULAR RACE OF COTTON RAT FROM THE FLORIDA KEYS

By GLOVER M. ALLEN

In April, 1920, Mr. Winthrop Sprague Brooks collected two adult cotton rats (*Sigmodon*) on Big Pine Key, Florida, which are so different from those of the neighboring mainland, that they seem worthy of recognition as representatives of a distinct island race. Through the generosity of Dr. Thomas Barbour, the specimens are in the collection of the Museum of Comparative Zoölogy to the authorities of which I am indebted for the privilege of studying them.

Big Pine Key is one of a group of small islands lying some thirty-five miles southwest of Cape Sable, the nearest point on the mainland of Florida. A chain of larger and smaller islands trends northeast from Big Pine to Key Largo and forms the eastward margin of the Bay of Florida. The other islands of the chain continue westward to the Dry Tortugas. These southern keys have no doubt been separated from the peninsula itself for a long period.

Due to the investigations of Messrs. F. M. Chapman and Outram Bangs, the cotton rat of the subtropical tip of the Florida peninsula has long been recognized as a well-marked geographical race,—*Sigmodon hispidus spadicipygus*,—readily distinguishable from the larger and darker races to the north,—*S. h. littoralis*, covering most of peninsular Florida, and *S. h. hispidus* of Georgia and the southeastern states. The new race needs comparison with the first-named only. It may be known as

Sigmodon hispidus exsputus¹ subsp. nov.

Type, adult male, skin and skull, 18,100 Mus. Comp. Zoölogy, from Big Pine Key, of the southern Florida Keys, collected April 16, 1920, by Winthrop S. Brooks.

General characters.—Small, about the size of *S. h. spadicipygus* but with a proportionally longer tail; at once distinguishable from the latter race by the general pale ochraceous tone of the dorsal surfaces of head and body, with slaty rather than blackish bases to the hairs, and the clearer white of the belly with the bases of the hairs less prominent and of a paler slaty gray.

Description.—General color of the dorsal surfaces pale "ochraceous buff," clearest along the sides of the cheeks and body, becoming slightly deeper on the rump. The long overlying hairs of the pelage on the lower half of the back are whitish tipped instead of black throughout as in the mainland form. The concealed bases of the hairs are slaty instead of blackish, and lack the indistinct brownish cast of *spadicipygus*. Belly nearly clear white, the color rather sharply marked off at the sides, the pale slaty bases of the hairs showing through but little, in contrast to the mainland form in which the transition from the color of the back to that of the belly is less sharp and the belly much tinged with brownish and slaty where the bases of the hairs show through. Fore feet above like the sides; the hind feet dusky with a sprinkling of dull-whitish hairs. Tail dusky, with short sparse hairs which are blackish above, faintly whitish below.

The skull is essentially as in *S. h. spadicipygus*, but a very little slenderer.

* *Measurements*.—The collector's field record gives the following: total length 259 mm., tail 117, hind foot 33.5, ear 18.5. The skull measures: greatest length 36.5 mm., basal length 32, palatal length 28.5, nasals 15, upper tooth row 6, lower tooth row 6, zygomatic width 20.5, mastoid width 15.

Remarks.—In a series of twenty excellent skins from Cape Sable and Flamingo, collected in late March and early April and representing *spadicipygus*, there is but one (Bangs Coll. 4490 from Flamingo) that closely resembles the island race in its color. It is at once distinguishable, however, by its slightly brownish or rusty tint especially on the lower back, by the blacker bases of the hairs, and by its much shorter tail. In eighteen specimens of *S. h. spadicipygus* the collector's field measurements indicate that the tail averages 37 per cent (extremes 35 to 41) of the total length, whereas in the two island specimens it is much longer, 45 per cent in each, a difference at once obvious to the eye. Both specimens were shot by Mr. Brooks in the day time, while they were running actively about in the scrub.

¹ *exsputus*, cast out, banished, exiled.

DESCRIPTION OF A NEW SPECIES OF BEACH MOUSE FROM
FLORIDA

BY ARTHUR H. HOWELL

The group of mice typified by the oldfield mouse (*Peromyscus polionotus*) is a plastic group, occupying a rather limited area in Georgia, Alabama, and Florida, but splitting into a number of well-marked forms. In the interior these mice live chiefly in sandy fields, either cultivated or uncultivated, and on the coast occupy the sandy ocean beaches where the vegetation consists chiefly of sea oats (*Uniola* sp.) and scattering clumps of bushes.

In Florida, five forms are at present recognized, four on the mainland and one on Anastasia Island (opposite St. Augustine). Osgood¹ gives all of them the rank of subspecies and (with the possible exception of *phasma*) this seems to be the logical course, but too little collecting has been done to permit of defining exactly the ranges of the various races. In general, however, we know that typical *polionotus* occupies southern Georgia, the greater part of eastern Alabama, and extreme northern Florida; *niveiventris* is apparently confined to the ocean beaches on the Atlantic coast from Hillsboro Inlet north to Mosquito Inlet; *rhoodsi* occupies the western side of the peninsula in the region north of Tampa Bay and possibly ranges most of the way across to the Atlantic side, probably intergrading with both *niveiventris* and *polionotus*; *albifrons* is known from the region around Choctawhatchee Bay, extreme western Florida, and from the ocean beaches in southeastern Alabama east of Mobile Bay; *phasma* is confined to Anastasia Island.

The discovery of a strikingly marked new species on Santa Rosa Island—a narrow sandy island about 50 miles long extending from the mouth of Pensacola Bay to the mouth of Choctawhatchee Bay—is rather surprising and of great interest. The island is separated from the mainland only by a shallow bay, in places not over a quarter of a mile wide but the species living on the island is totally unlike the form found on the nearby mainland. It is by far the palest form in the group and, unlike the races occupying the beaches of eastern Florida, is of a drab rather than a buffy tone.

The form occupying the mainland opposite Santa Rosa Island—*albifrons*—ranges also, as has been stated, over the Gulf beaches of

¹ Osgood, W. H., N. Am. Fauna no. 28, pp. 104–109, 1909.

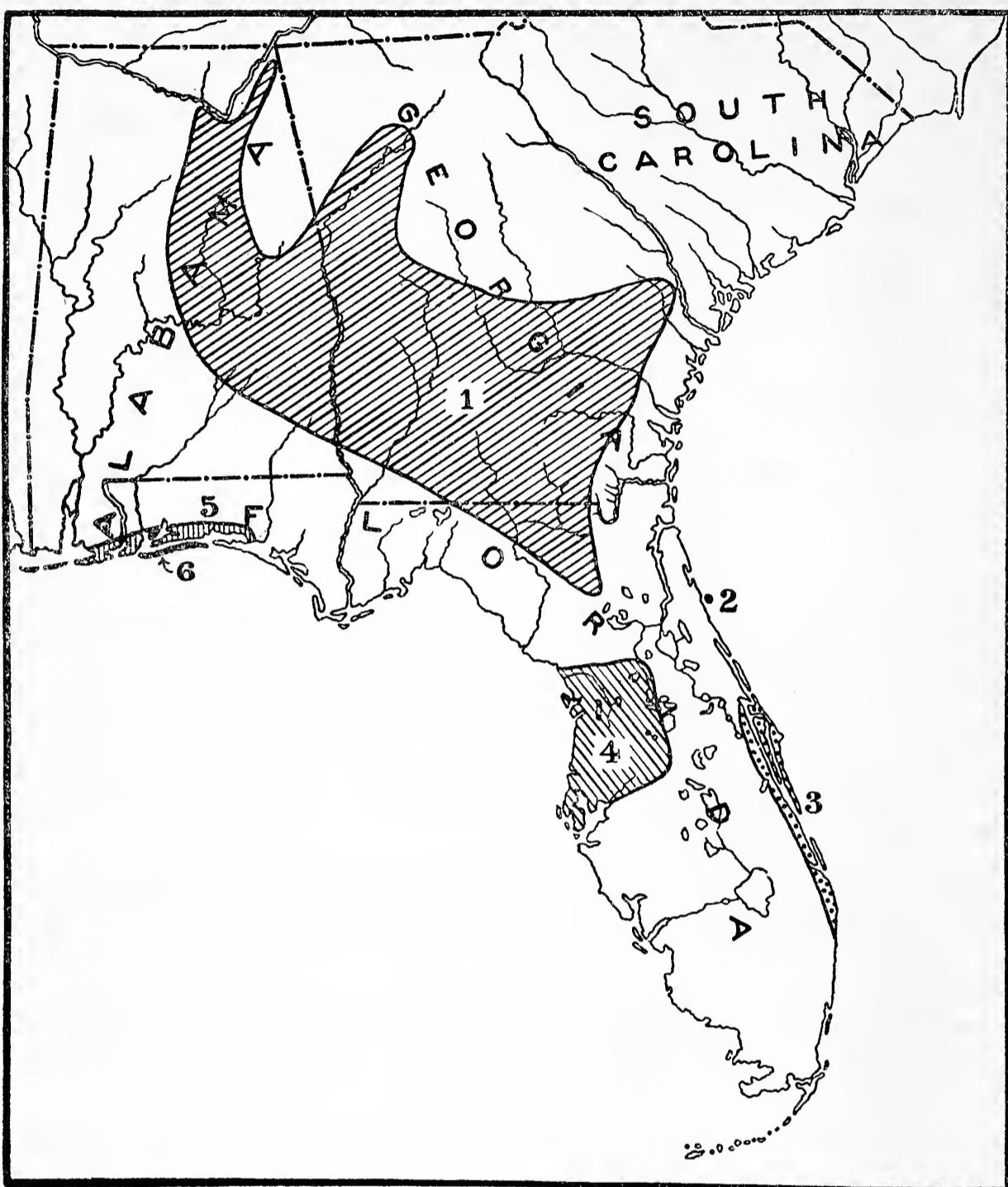


FIG. 1. PROVISIONAL MAP OF THE DISTRIBUTION OF THE OLDFIELD AND BEACH MICE *Peromyscus polionotus* group

1, *Peromyscus polionotus polionotus*; 2, *Peromyscus p. phasma*; 3, *Peromyscus p. niveiventris*; 4, *Peromyscus p. rhoadsi*; 5, *Peromyscus p. albifrons*; 6, *Peromyscus leucocephalus nobis*.

southeastern Alabama where the conditions are practically the same as on Santa Rosa Island, but the series from the Alabama beaches is practically the same as the type series from the north side of Choctawhatchee Bay (Whitfield, Florida).² The strip of beach in Alabama where the mice occur extends from the mouth of Perdido Bay westward to the mouth of Mobile Bay (the specimens being labelled "Bon Secour" and "Orange Beach"); there is direct connection between the beach and the mainland. We have, therefore, in the case of *leucocephalus* a striking illustration of the effect of isolation in perpetuating color variations, and in the case of the Alabama representatives of *albifrons* the inadequacy of a peculiar environment apart from isolation to produce similar changes.

Peromyscus leucocephalus sp. nov.

WHITE-HEADED BEACH MOUSE

Type, No. 234,358, U. S. Natl. Mus., Biological Survey collection; ♀ adult, skin and skull, from Santa Rosa Island, opposite Camp Walton, Florida; collected February 26, 1920, by A. H. Howell; original number 2392.

Specific characters.—Similar to *Peromyscus polionotus phasma* but color tone of upperparts drab instead of buff; colored dorsal area narrower, the whole of the sides white; entire head and face, except crown, white; paler, more extensively white, and slightly larger than *Peromyscus p. albifrons*. Skull similar to that of *phasma*, larger than that of *albifrons*.

Description of type.—Dorsal area, occiput, and crown light drab; rest of head, face, sides, underparts, and limbs white (the hairs white to base); ears whitish at base, becoming mouse gray at tips; tail unicolor, white, with a faint tinge of drab.

Measurements.—*Type*: Total length, 140; tail vertebræ, 51; hind foot, 18.5; ear from notch (dry), 11; average of 10 adults from type locality, 128.3; 48.4; 18.2; 10.9. *Skull* (of type): Occipito-nasal length, 23.6; zygomatic breadth, 12.3; interorbital breadth, 3.6; length of nasals, 9.1; maxillary tooth row, 3.5.

Remarks.—This new mouse is abundant on Santa Rosa Island and apparently is very similar in habits to the other beach mice of this group. Its tracks and trails are seen everywhere among the sparse growth of sea oats on the ridge of dunes close to the beach and numerous small burrows evidently made by the mice are found in the face of the sand hills. A considerable number of the burrows were opened with a shovel but none of the mice could be dislodged. Most of

² They average slightly paler (less brownish) on the back than typical *albifrons* but the heads are no more whitish.

the burrows were shallow, but one was found to extend for a distance of five feet into the perpendicular face of a hard sand hill. This burrow was about an inch in diameter and inclined slightly upward from the entrance. At the terminus of the burrow was a small, flat nest of dead grasses and a little pile of shelled pods of a wild pea (*Galactia* sp.). Another burrow was about three feet long and contained a similar nest and pile of pea pods.

GENERAL NOTES

ATTACKED BY A COUGAR?

In February last, during a short expedition in Venezuela, I had an interesting encounter with a cougar which seems worth relating as a possible addition to the rather scanty evidence that this animal does not always flee from man. The incident occurred in the foothills of the Sierra de Perijá near the Rio Cogollo, some eighty miles southwest of the city of Maracaibo. This locality is on the frontier of the region held by the hostile Motilone Indians and therefore little frequented and practically in virgin condition.

At about ten o'clock one morning, after visiting a short line of traps and spending several hours hunting for deer, I started to backtrack toward camp, following in general the same fairly marked deer trails over which I had just passed. Although the forest was rather thin, passage was impeded by light but much entwined underbrush except on these trails or in occasional small grassy openings suggestive of the extensive savannas lying a few miles eastward. At a turn in the trail and on the crest of a wooded knoll, when I was halfway to camp, feeling the heat of the powerful sun, passing a spot previously reconnoitered carefully for deer, and hence not so alert as before, I was suddenly confronted by what to my astonished eyes seemed the largest cougar that ever grew. It started from behind some low bushes at my left and fifty feet, or at most sixty feet, in front of me. I did not see it rise, but it gave the impression of having been lying down. The forest was rather scraggly at this point and the trail I was following was dissolved in several small openings, in one of which the animal appeared, so the sensation of meeting it directly in the trail was lost. It started toward me immediately, growling savagely, its eyes blazing, tail lashing, and if there was any indication that it did not intend to make away with me, I failed to recognize it. It did not come on the run, however, and whether it would have done so or not I cannot say, for its long feline strides were so full of determination I did not care to await developments but promptly fired a load of buckshot full into its face. It dropped instantly and rolled behind some small bushes which prevented me from firing the second barrel. I had a flash of elation, but the glowering visage was still uppermost in my mind; so, instead of running in with my other barrel, I prudently stopped to reload the one already fired and while the gun was open the cougar rose and disappeared in a dense thicket leaving scattered drops of blood and a trail which I could not follow far without dogs. Failure to kill the beast of course caused considerable chagrin, but the unique experience was some consolation.

Both the appearance of the cougar in the daytime and its failure to run at first sight of a man are probably accounted for by the wildness of the region. Although human habitations are not far to the eastward, there are many square miles to the westward never traversed by white men and, although wild tribes still occupy some parts, there are many very large areas from which they too are absent. It is not impossible, therefore, that this cougar had never before seen a human being. This is perhaps less likely than that it had been following my trail, as it had that of other humans and, upon my sudden appearance, felt cornered, so advanced instead of retreating. At any rate, there is at least one person who is sufficiently convinced that some cougars under some circumstances may be far from cowardly.

—W. H. Osgood.

THE JAGUAR IN COLORADO

Is this an additional jaguar record for the United States and a new mammal for Colorado? Rufus B. Sage, while camped on Soublet's Creek at the base of the Rockies, head waters of the Platte, within 30 or 40 miles of Long's Peak and 2 days' march from Fort Lancaster, in December of 1843, says: "One of our party encountered a strange looking animal in his excursions, which from his description, must have been of the Leopard family. This circumstance is the more remarkable, as Leopards are rarely found except in Southern latitudes. However, they are not infrequently met in some parts of the Cumanche country, and their skins furnish to the natives a favorite material for arrow-cases." (Rocky Mountain Life, p. 347.) As Sage was quite familiar with panthers and bobcats this may have been jaguar or ocelot.

—Ernest Thompson Seton.

DIURNAL NEST-BUILDING BY A WOOD RAT

Wood rats are usually considered nocturnal, or at least nocturnal and crepuscular, in their habits. On the W Triangle Ranch, near the head of Cataract Canyon, 12 miles west-southwest of Anita, Arizona, one was observed at 5:10 p.m., September 19, 1916, building a nest in a cavern among the rocks. The animal was first seen carrying *Gutierrezia* stems from just outside the entrance of the cavern, where it had apparently stored a small supply. It made two trips to this little pile, which was about 8 feet from the nest, gathered 5 or 6 stems in its mouth, and carried them to the nest, where it worked assiduously placing them with its mouth and fore-feet. After I had watched it for 5 minutes, it discovered me and hid its head behind a rock, and,—ostrich-fashion—seemed to think it was hidden. A slight movement on my part and it disappeared into a hole among the rocks back of the nest. When the rat was first observed she was exposed to direct sunlight which entered that part of the nest upon which she was working. And when she was trying to hide, though still visible, in the interior of the cavity, she was in diffused daylight—by no means in darkness.

The basal and external parts of the nest consisted of sticks (largely the woody part of *Atriplex* and *Gutierrezia*) and a smaller portion of pieces of cactus (mostly *Opuntia* and *Echinocereus*), which formed a semicircle around the anterior (near

the cavern entrance) part of the nest. Within this was a circle of coarse stems and leaves of *Gutierrezia*, inside of which was the nest proper, composed of fine plant-fibres and grama grass. The entire nest, sticks and all, was about $2\frac{2}{3}$ feet long (length extending *into* the cavern) and $1\frac{1}{2}$ feet wide (*across* the cavern). The part composed of plant fibre and grass was externally 8 inches in diameter, and internally (nesting cavity) 6 inches in diameter. The nesting cavity was 3 inches deep and entirely open above, evidently in process of construction.

My stay in this region was limited, so in order to be certain of the identity of the little nest-builder a Schuyler rat trap was set on the nest proper. Upon my return one-half hour later (5:45 p.m.) a female *Neotoma albigena albigena* (No. 215645, Biological Survey collection, United States National Museum) was in the trap. She had moderately developed mammae but contained no embryos.

—Hartley H. T. Jackson.

A SECOND RECORD OF PHENACOMYS ALBIPES IN CALIFORNIA, WITH A DISCUSSION
OF THE SPECIES

On July 11, 1919, the writer secured a young but apparently breeding female of *Phenacomys albipes* three miles north of Orick, Humboldt County, California, which specimen constitutes the second record of the species for the state. It was taken in an oat-baited trap under a log-jam near the bank of a stream which flows through dense redwood and maple forest. This individual does not fully agree with published descriptions, so S. W. Jewett kindly loaned me for comparison three specimens of this species from his own collection, and one belonging to the Oregon Fish and Game Commission. I was also generously permitted to examine the type of *albipes*, in the collection of the Bureau of Biological Survey. Indications point to the fact that most of the cranial differences shown by my specimen may be accounted for by its age, which is less than that of the others. However, it varies individually in having narrower incisive foramina with posterior constriction, and a slightly different enamel pattern.

As the six specimens of *P. albipes* before me are more than have ever been available for study heretofore, it seems desirable to put on record some of the *average* characters of the species as indicated by this series. I find that the feet of the type are the palest of any in the lot; they are of a pronounced grayish cast, and not pure white as in *P. orophilus*. The ears of the Orick example are covered with black hairs, while in the other five these members are almost naked. As with most other microtines, the enamel pattern of the molariform teeth varies considerably within certain limits, and one must be careful not to give equal weight to all dental differences. The enamel pattern of the upper teeth is rather constant in the five skulls of *albipes* at hand (the sixth is too old, worn, and broken to be of much value in this connection). In the case of the lower teeth, M_1 of the type is unusual in having the outer triangles very irregular in position and size; while, in the other four, these are quite uniform. The Orick specimen is peculiar in having the anterior trefoil of M_1 with the outer loop situated entirely posterior to the other two. In two specimens there is a tendency for the antero-external loop of M_2 to open. Normally, in M_3 there is a slight constriction in the enamel fold near the external end of the middle digitation, but in the Orick skull this is developed into a pronounced, though small, outer triangle.

After studying the California species of *Phenacomys*, I can see nothing to be gained by adopting the subgenus *Arborimus* Taylor. Most of the characters on which it is based are either very slight, or inconstant. It seems to me that the genus is an unusually well-defined one, and that nothing whatever can be gained by further division. However, if a subgenus *must* be recognized, let it contain only *longicaudus*, and be based upon the arboreal habits and hairy tail of that species, rather than on ill-defined characters that can be segregated only with considerable difficulty.

—A. Brazier Howell.

NOTES ON FLYING SQUIRRELS AND GRAY SQUIRRELS

It does not seem to be generally known to lovers of the out-doors that the flying squirrel is well distributed over a large area of the United States and Southern Canada. On March 27, while taking a walk in the woods of the bluffs of the Mississippi River, I tapped a dead poplar tree which looked to me as if the cavity in it might be the home of a flying squirrel. Within a few seconds, a flying squirrel did come out of the hole, but it was evidently very reluctant to leave its comfortable nest. It ran to the other side of the tree, entered by another hole and came out of the first hole again. This it did five times. My friend and I thought at first that we had discovered the home of a whole family of squirrels, but soon discovered that the little creature had been fooling us on the census. At last it climbed up to the top of the dead tree and then disappeared in the top of a live basswood to the right.

We returned to the same tree in about half an hour and again, by tapping the nest tree gently with a stick, induced the squirrel, which by this time had returned, to come out. On this occasion it uttered a rat-like squeak as it climbed up on the other side of the tree and again made for the top of the basswood. From that position it glided away about sixty feet to the bottom of another tree lower on the slope, gracefully clearing any of the intervening branches. On the 1st of April, I again visited the place. This time I had a camera with me and although I found it rather difficult to drive out the squirrel, and also take a picture, I succeeded in getting one fair photograph. The squirrel again had to be driven out several times before he finally left the nest and disappeared in the top of the basswood.

On April 10, I took a walk through the same woods and discovered in a scarlet oak tree near a field and a pasture, one of the well-known leafy squirrel nests about twenty feet up. The nest looked quite fresh and, when a friend tapped the tree with a stick, a large gray squirrel came out, apparently quite reluctant to leave the nest. As neither of us was dressed for climbing trees, we left the place without examining the nest. The next day, I returned and climbed the tree. I found the nest a very well-built, compact structure with a small entrance on the southwest side near the top. In the nest were four young. Although it had rained quite a little on the preceding day and for several hours during the night, the nest which was lined with very fine, soft grass, was perfectly dry, the structure being apparently rain proof. I took the young out, carried them down in my hat, covering them up carefully, and photographed them.

The backs were covered with very short gray hair, the bellies were still almost naked and had a pinkish appearance, the tails looked like rat tails and were about as long as the bodies and were covered with a very short growth of hair. The animals were about four inches and a half long, and their eyes were still closed. If they had had short tails, they would have resembled young bull pups very closely. They crawled about very much like young pups and kittens. The mother we did not see on this occasion. After photographing the young, my companion returned them to the nest. On both occasions, when they were taken out and when they were returned, they uttered a sharp squeak, which I could plainly hear with the wind at a distance of seventy-five yards.

I judge that the four young together weighed nearly as much as an adult gray squirrel. The nest was perfectly clean and dry, with no droppings or smell of urine about it, and I have wondered a good deal how the animals managed to keep it so clean. The young were apparently about a week or ten days old, which would mean that they were born about the first of April. We have had steady cold weather through the winter, including the first half of March, and only the last few days have been warm and spring-like. I was rather surprised to find the young squirrels in a nest of leafy twigs. I had the idea that they were generally born in a hollow tree. Possibly some of the readers of the Journal can give further information on both flying squirrels and gray squirrels.

The wooded strips of broken bluffs that line all our plains rivers are ideal resorts for small game animals and for song birds and game birds, and I think members of the society should endeavor to have game refuges established on land of this kind all over the country, where young and old can get glimpses of our interesting wild birds and animals. The strip of woods which I refer to extends about ten miles on the west bank of the Mississippi north from the town of Hastings toward St. Paul. The land is under cultivation to the edge of the bluffs, but the bluffs are too rough for cultivation, and the river bottom, from a mile to a mile and a half wide, is flooded during periods of high water, and is occupied by marshes, lakes and strips of river-bottom timber, including cottonwoods, soft maples, white ash, hackberry, and elm.

—D. Lange.

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DATES OF SHEDDING OF HORNS

Below are the dates on which examples of some of the species of deer, and the American antelope, dropped their horns in the National Zoological Park at Washington, D. C., during the season of 1919–1920.

Barasingha deer (<i>Rucervus duvaucelii</i>).....	December 13; January 29
Prong-horned antelope (<i>Antilocapra americana</i>).....	December 23
Virginia deer (<i>Odocoileus virginianus</i>).....	January 25, 27, and 29
Black-tailed deer (<i>Odocoileus columbianus</i>).....	January 26
Mule deer (<i>Odocoileus hemionus</i>).....	February 24
American elk (<i>Cervus canadensis</i>).....	March 3
European red deer (<i>Cervus elaphus</i>).....	March 23
Japanese deer (<i>Sika nippon</i>).....	March 31
Kashmir deer (<i>Cervus hanglu</i>).....	April 8

Fallow deer (<i>Dama dama</i>).....	May 3
Sambar (<i>Rusa unicolor</i>).....	June 18
Hog-deer (<i>Hyelaphus porcinus</i>).....	July 8

It would be interesting to have dates from other zoological gardens, both in America and Europe, for comparison.

—N. Hollister.

RECENT LITERATURE

Hall, Harvey Monroe, and Joseph Grinnell. LIFE-ZONE INDICATORS IN CALIFORNIA. Proc. California Acad. Sci., ser. 4, vol. 9, no. 2, pp. 37-67. June 16, 1919.

Few devices for handling the data of geographic distribution of animals or plants have been more useful than the life-zone. For satisfactory zonal diagnosis of a given locality it has usually been necessary to make an exhaustive study of the entire fauna and flora. To obviate this necessity, so far as California is concerned, is the hope of the authors of this paper, who proceed to list certain critical species of plants, amphibians, reptiles, birds, and mammals as life-zone indicators.

Almost at the outset the importance of recognizing local modifying factors is emphasized. Those considered are slope exposure, air currents, streams carrying cold water, evaporation from moist soil, proximity to large bodies of water, influence of lingering snow banks and of glaciers, changes in vegetal covering, extent of a mountain area, rock surfaces, miscellaneous local influences.

Five criteria are given as among those used in the selection of the life-zone indicators. Briefly stated these are (1) Only breeding records have been taken into account. (2) In plants perennials are usually preferred to annuals. (3) The more abundant a species the greater its value as an indicator. (4) A particular indicator, though constant in zonal position in one portion of its range may be unreliable when its entire range is considered, due "perhaps to the possible development of hardy strains in one portion of the range and not in another," or to some other cause. Furthermore, biotypes, similar in external characters but reacting differently to their environment, may escape detection by the taxonomist. (5) So far as possible, indicators listed by C. Hart Merriam are used, since the authors in the main accept his delimitation of the life-zones.

The lists of mammalian indicators include: For the Lower Sonoran, 78 forms belonging to 34 genera; Upper Sonoran, 48 forms, 18 genera; Transition, 27 forms, 14 genera; Canadian, 30 forms, 15 genera; Hudsonian, 7 forms, 5 genera. No mammals, reptiles or amphibians are listed for the Alpine Arctic, the sole indicator aside from plants being the rosy finch, *Leucosticte tephrocotis dawsoni*. It so happens that among the animals listed there are more mammalian indicators than bird, reptile, or amphibian for each zone except the Transition (which has three more bird indicators than mammalian) and the Alpine Arctic.

The paper will be of interest to every student of the distribution of the higher vertebrates of the western states.

—Walter P. Taylor.

Fitzsimons, F. W. THE NATURAL HISTORY OF SOUTH AFRICA. MAMMALS. Vol. I, pp. i-xix, 1-178, 51 plates; Vol. II, pp. i-xi, 1-195, 48 plates. London; Longmans, Green and Co., 1919.

The director of the Port Elizabeth Museum has given us a much needed work on the life-histories of the mammals of a region of very great interest. Based on long years of actual observation, his accounts of the various species, many of which are rapidly disappearing before the advance of settlement, are of more than usual completeness, and are presented in an entertaining style. The first volume includes the primates, bats, and Felidæ; the second contains accounts of the Viverridæ, the aard-wolf, hyenas, Canidæ, Mustelidæ, and the Cape sealion. A systematic index precedes and an outline of classification of the forms dealt with closes each volume. The main body of the text is decidedly popular and some of the biographies are extensive, that of the chacma including 40 pages. Well-selected anecdotes, usually based on first-hand experiences, help to complete the pictures of the homes, lives, and characteristics of the animals. The author's keen sympathy with wild creatures is evident throughout the work; extermination apparently necessary is deplored, and useless killing is condemned. The classification adopted, while in the main modern, is, in one place, curiously antiquated; the bat genera *Taphozous*, *Nyctinomus*, *Mormopterus*, and *Chærephon* being included in the family Vespertilionidæ. It is to be regretted that the International Code has not been followed strictly in the selection of names. In works for popular use these matters often are slighted, but there, if anywhere, they should be painstakingly correct; and differences in opinion might well be explained. It is presumed that the remaining volumes will include the rodents and ungulates, and naturalists interested in the wondrous animal life of South Africa will look forward with pleasure to their appearance.

—N. Hollister.

Rathbun, Mary J. REPORT OF THE CANADIAN ARCTIC EXPEDITION, 1913-18. VOL. VII: CRUSTACEA. PART A: DECAPOD CRUSTACEANS. Southern Party—1913-16, pp. 1-14D. Ottawa, August 18, 1919.

In this paper Miss Rathbun, listing the decapod crustaceans collected by the expedition, identifies the following species taken from the stomachs of the bearded seal, *Erignathus barbatus* (Erxleben), and common rough seal, *Phoca hispida* Schreber:

- Spirontocaris grænlandica* (J. C. Fabricius) from *E. barbatus*.
- Spirontocaris spina* (Sowerby) from *P. hispida* and *E. barbatus*.
- Spirontocaris phippsii* (Kröyer) from *E. barbatus*.
- Spirontocaris polaris* (Sabine) from *E. barbatus*.
- Sclerocrangon boreas* (Phipps) from *E. barbatus*.
- Sabinea septemcarinata* Sabine from *E. barbatus* and *Phoca foetida* (*hispida*).

—R. M. Anderson.

Dall, William Healey. REPORT OF THE CANADIAN ARCTIC EXPEDITION, 1913-18. VOLUME VIII: MOLLUSKS, ECHINODERMS, COELENTERATES, ETC. Part A: MOLLUSKS, RECENT AND PLEISTOCENE. Southern Party—1913-16, pp. 1-30A. Ottawa, September 24, 1919.

In this paper Dr. W. H. Dall, honorary curator of mollusks, United States National Museum, in describing the mollusks collected by the expedition, iden-

tifies the following species taken from the stomachs of bearded seal, *Erignathus barbatus* (Erxleben), taken at Bernard harbour, Dolphin and Union Strait, Northwest Territories: *Margarites helicinus* Fabricius, *Musculus lavigatus* Gray, *Saxicava arctica* Linné, *Cylichna* sp. (fragment), opercula of *Buccinum* sp. indet., ovicapsules of *Buccinum* sp., *Utriculus* sp. (fragments), *Margarites sordidus* Hancock (fragments), molluscan egg capsules, egg capsules of unknown gastropods.

—R. M. Anderson.

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- DE LANGE, DAN., JR. Contribution to the knowledge of the placentation of the Cape goldmole (*Chrysochloris*). Bijdragen tot de Dierkunde, Amsterdam, vol. 20, Feest-number, pp. 165-173, pls. 4-7. Leiden, 1919.
- DEXTER, JOHN S. Albino vertebrates. Science, n. s., vol. 52, pp. 130-131. August 6, 1920. (Record of albino *Citellus richardsoni* from Saskatchewan.)
- DREYER, W. Vejleder i Zoologisk Have. Pp. 1-72; many figs. Kjöbenhavn, 1920. (Guide to the Copenhagen zoological gardens for the spring of 1920. According to the annual report, which arrived in the same mail, the collection contained on January 1, 1920, 365 mammals of 124 species.)
- EARNSHAW, FRANK L. See Lawyer, Geo. A., and Frank L. Earnshaw.
- FLOWER, S. S. Report on the Zoological Service for the year 1919. In which is included the 21st annual report of the Giza Zoological Gardens. Ministry of Public Works, Egypt, pub. no. 31, pp. 1-26. Cairo, 1920.
- GIDLEY, JAMES WILLIAMS. Pleistocene peccaries from the Cumberland cave deposit. Proc. U. S. Nat. Mus., vol. 57, pp. 651-678; figs. 1-13; plates 54-55. 1920. (Revised definitions for the families Suidæ and Tayassuidæ, and the genera of peccaries. Describes two new species each of *Platygonus* and *Mylohyus*.)
- HARRISON, H. S. The ascent of man: a handbook to the cases illustrating the structure of man and the great apes. The Horniman Museum and Library no. 13, pp. 1-74. London County Council, 1920.
- HINTON, MARTIN A. C. The Irish otter. Ann. and Mag. Nat. Hist., ser. 9, vol. 5, p. 464. June, 1920. (Revives the name *Lutra roensis* Ogilby, 1834; and recognizes the otter of Ireland as a subspecies of *L. vulgaris*.)
- HINTON, MARTIN A. C. The species of *Pedetes* inhabiting Angola. Ann. and Mag. Nat. Hist., ser. 9, vol. 6, pp. 102-104. July, 1920. (*Pedetes angolæ* sp. nov.)
- HINTON, MARTIN A. C. Three new mammals from northern Rhodesia. Ann. and Mag. Nat. Hist., ser. 9, vol. 6, pp. 239-242. August, 1920. (Describes *Mimetillus thomasi*, *Kerivoula lucia*, and *Zelotomys shortridgei*.)

- HINTON, MARTIN A. C., AND P. S. KERSHAW. On a collection of mammals from the Dinka country, Bahr-el-Djebel. Ann. and Mag. Nat. Hist., ser. 9, vol. 6, pp. 94-101. July, 1920. (New: *Taterona benvenuta*, *T. b. lucia*, and *Acomys wilsoni argillaceus*.)
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- HOWELL, A. BRAZIER. A study of the California jumping mice of the genus *Zapus*. Univ. California Publ. Zool., vol. 21, pp. 225-238, 1 text fig. May 20, 1920. (Describes one new form, *Zapus trinotatus eureka*, from Fair Oaks, Humboldt County, California.)
- JORDAN, DAVID STARR. The fur seals. Science, n. s., vol. 52, p. 255. September 3, 1920. (Regards the recent five years closed season as "absurdly needless.")
- KERSHAW, P. S. See Hinton, Martin A. C., and P. S. Kershaw.
- KLOSS, C. BODEN. On mammals collected in Siam. Journ. Nat. Hist. Soc. Siam, vol. 3, pp. 334-407, pls. 7-8. December 31, 1919. (Report on 340 specimens collected in 1916. New forms include *Presbytis argenteus*, *P. cristata koratensis*, *P. germaini changensis*, *Macaca nemestrina indochinensis*, *M. irus atriceps*, *Viverricula malaccensis thai*, *Tupaia glis cambodiana*, *T. g. olivacea*, *Tamiops maclellandi liantis*, *Menetes berdmorei peninsularis*, *Rattus rajah koratis*, *R. r. kramis*, *R. rattus lanensis*, *R. r. kramensis*, *R. r. mesanis*, *R. r. koratensis*, *Bandicota siamensis*, and *Capricornis sumatraensis annexens*.)
- KURODA, NAGAMICHI. On a collection of Japanese and Formosan mammals. Annot. Zool. Japonensis, vol. 9, part 5, pp. 599-611. 1920. (Describes *Nyctalus noctula namiyei*, subsp. nov., from Otsukuejima, on the coast of Chikuzen Province, Kiusiu, Japan.)
- KURODA, NAGAMICHI. On two rare species of Muridae from the Central Mountains of Formosa. Dobutsugaku Zasshi, vol. 32, pp. 36-43, figs. 1-2, 1920. (Describes *Microtus kikuchii*, sp. nov., from 10,000 feet altitude on Mount Morrison, Formosa; and records two specimens of *Rattus culturatus* Thomas from the same locality.)
- LANG, HERBERT. The white rhinoceros of the Belgian Congo. Zool. Soc. Bull., vol. 23, pp. 67-92, numerous half-tone figs. July, 1920. (General account of the animal, its habits, physical features, distribution, habitat; with experiences of the author while collecting specimens for the American Museum of Natural History.)
- LAWYER, GEO. A., AND FRANK L. EARNSHAW. Game laws for 1920. A summary of Federal, State, and Provincial statutes. U. S. Dept. Agric., Farmers' Bull. 1138, pp. 1-84. August, 1920.
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- MOORE, CARL R. The production of artificial hermaphrodites in mammals. Science, n. s., vol. 52, pp. 179-182. August 20, 1920.

- MURPHY, ROBERT CUSHMAN. The seacoast and islands of Peru. I. Brooklyn Mus. Quart., vol. 7, pp. 69-95, 6 figs. April, 1920. (Includes discussion of the relation of ocean currents to the distribution of pinnipeds and other marine vertebrates. Maps show range of fur-seals, sea-elephants, and sea-lions.)
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- SHUFELDT, R. W. Tramps through the Gulf States—I. Amer. Forestry, vol. 26, pp. 489-496. August, 1920. (Photographs of the Texas armadillo.)
- SUMNER, FRANCIS B. The need for a more serious effort to rescue a few fragments of vanishing nature. Sci. Monthly, 1920, pp. 236-248. March. (A plea for permanent reservations for wild life that will preserve truly natural conditions.)
- SUMNER, FRANCIS B. Geographic variation and Mendelian inheritance. Journ. Exper. Zoöl., vol. 30, pp. 369-402; figs. 1-7; tab. 1-4. April, 1920. (Interesting experiments with different geographical races of California *Peromyscus*.)
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- THOMAS, OLDFIELD. *Notoryctes* in North-west Australia. Ann. and Mag. Nat. Hist., ser. 9, vol. 6, pp. 111-113. July, 1920. (Describes a new species, *N. caurinus*.)
- THOMAS, OLDFIELD. A new genus of Echimyinæ. Ann. and Mag. Nat. Hist., ser. 9, vol. 6, pp. 113-115. July, 1920. (*Lonchothrix emiliae* gen. et spec. nov., from Rio Tapajoz, Brazil.)
- THOMAS, OLDFIELD. On mammals from near Tinogasta, Catamarca, collected by Sr. Budin. Ann. and Mag. Nat. Hist., ser. 9, vol. 6, pp. 116-120. July, 1920. (New: *Octomys*, type *O. mimax* sp. nov.; and *Ctenomys coludo*; both from Argentina.)
- THOMAS, OLDFIELD. A new tuco-tuco from Tucuman. Ann. and Mag. Nat. Hist., ser. 9, vol. 6, pp. 243-244. August, 1920. (Describes *Ctenomys occultus* from Tucuman Province, Argentina.)
- WILLOUGHBY, CHARLES H. Beavers and the Adirondacks. Conservationist, vol. 3, pp. 67-70. May, 1920. (Beavers introduced from Yellowstone Park and other localities have restocked this region, where it is now estimated there are between 15,000 and 20,000 animals.)

EDITORIAL COMMENT

Many of those who heard Mr. Vernon Bailey's talk on "Modern methods in mammalogical field work," at the New York meeting of the Society last May, expressed the intention of capturing some small mammals for home vivariums. Doubtless most of these, like the writer, neglected to do so. But when Mr. Bailey departed on an extended field trip in July, he left in the editor's office an assortment of small cages containing field mice, deer mice, and pocket mice of various species. Before one day was gone it became apparent that these little creatures were going to be very interesting indeed, and they have since proved highly entertaining and instructive as well. The little pocket mice of the genus *Perognathus* are especially admired, as they can be handled at pleasure; but the commoner forms of *Peromyscus* and *Microtus*, although less gentle and confiding, are no less fascinating subjects for a cage on the study table. The editor can now recommend to all mammalogists the substitution of small furred animals for the conventional canary or goldfish.

Members of the Society are urgently requested to look over carefully the list of members which appeared in the last number. Many persons who should affiliate with the Society have doubtless not as yet had the matter brought to their attention, and a little effort will doubtless add several hundred names to the membership roll of the Society. The Journal could be greatly enlarged and improved by an increased revenue.

The actual date of publication of the preceding number of the Journal of Mammalogy (vol. 1, no. 4) was August 24, 1920.

The *National Humane Review* for May, 1920, makes the statement that "zoos and menageries are survivals of that Roman civilization which perished under practices of cruelty, selfishness, cupidity and immorality, and these qualities are actively disclosed now in our own civilization by our approval and patronage of wickednesses which helped wreck the Romans;" and, further along, that "zoos and menageries are essentially barbaric," and that the training of wild animals almost always results in "diabolical cruelty."

It is unfortunate that a great organization like the National Humane Society, which is doing so much good in some ways, should adopt an attitude of hostility to the zoological garden, when it ought to give such institutions its cooperation and help. Of course the statements quoted are not to be taken seriously; a magazine devoted to reform must be in a measure sensational. The zoo is a survival of the Roman civilization, it is true; but so is the school, the art museum, and the public bath. The zoological garden idea is much older than the Romans; the ancient Egyptians kept collections of wild animals, as doubtless did still earlier peoples, far back of all record. Well-conducted zoological gardens offer great educational and recreational advantages, which are being more and more appreciated, and new zoos are now being established in cities throughout the world. They are very popular—much more so than most other educational establishments—and because they appeal to a vast number of people they are able, unquestionably, to do a great deal of good. Approximately two

million people annually visit the New York Zoological Park and the National Zoo in Washington. A total attendance of 2,229,605 was recorded for the year ending June 30, 1920, at the latter establishment. This does not necessarily imply that there are that many "barbarians" among the people of Washington or the visiting tourists, for some of the enthusiasts visited the zoo at least once a week during the year; some of the most interested went oftener.

The modern zoological garden is conducted on a much higher plane than was the ancient animal collection. There have undeniably been cruelties to animals in menageries in times past. Those familiar with our leading gardens nowadays know how much expert care is given the animals, how contented and happy most of them are, and how much longer many species live in captivity than in a wild state. Most wild animals resist capture, it is true, but so does a colt or a domestic pig. Once safely in the modern zoological garden almost any wild creature rapidly becomes a contented pet. Kindness and consideration for his charges is one of the first essential qualifications required of the keeper, and no brutal or inhuman act is tolerated. In the first place, it does not pay; animals are expensive, and every care must be taken to insure that contentment necessary to good health and a long survival. The management now is most certain to be made up of animal lovers and protectionists, men who are naturally kind to animals, and constantly working for their preservation and good. Improved buildings, cages, and paddocks are all the time being devised; improved methods of care are constantly being studied; any plan, in short, that tends to better conditions for the comfort and health of the animals is eagerly adopted as soon as its merits are proved.

The writer does not particularly care for trained animal shows, and does not know a great deal about methods used in teaching wild animals to perform, but he has had some acquaintance with trainers, and in so far as his experience goes has never seen or heard of, first hand, the "diabolical cruelty" so often credited to the profession. There may be a difference of opinion, of course, as to just what constitutes "diabolical cruelty," but the few professional animal trainers personally known to him have been kindly, big hearted men, with an intense love for animals; men who would be decidedly and vigorously quick to resent any act of cruelty, torture, or even annoyance to their pets. Isolated cases of cruelty to animals in zoos and menageries today are not representative of conditions in general. The zoo as a public institution should not be condemned because of such cases. The *National Humane Review* records many cases of extreme brutality and crime to children by acts of human monsters, but no one advocates the abolishment of the privilege of rearing children because of these unnatural, isolated cases.

Zoological parks and exhibitions of living animals will probably always be with us; the idea is growing in popularity all the time, and becomes more important as the natural ranges of wild creatures become restricted. Conspicuous species and groups of animals are being hunted and trapped from the face of the earth, or crowded out of existence by man's use of the land, and many forms will soon survive only in park-reared examples. Fortunate indeed may be the fare of the family of animals that is safely settled in a comfortable park paddock, while their kind in a wild state are being hunted to actual extermination.

Any cruelty or acts of negligence in the care of animals should be condemned. But it is folly, because of isolated cases in ill-managed menageries, to condemn all zoological collections; to advocate depriving the children of their joy, adults of their recreation and pleasure, and the scientists and artists of the opportunity for study. If the writers in the *Humane Review* were more familiar with actual conditions in our best up-to-date zoological gardens, they probably would not make such sweeping statements.

An official from the local Humane Society once visited the zoological park in Washington to investigate an alleged case of cruelty to a bear. After examining into the case he admitted that the charges were wholly false. When he returned to his carriage, however, an animal-loving park employee directed his attention to the extreme type of overcheck he was using. On his next visit to the park, this agent sheepishly admitted on inquiry that he had removed this check just before entering the grounds. He knew it was wrong, was ashamed again to be seen with it in the park, yet persisted in its use. But we do not sweepingly condemn all humane societies because of this isolated case of cruelty to his horse by one of their officials. In the main, they have our genuine sympathy and hearty support.

—N. H.

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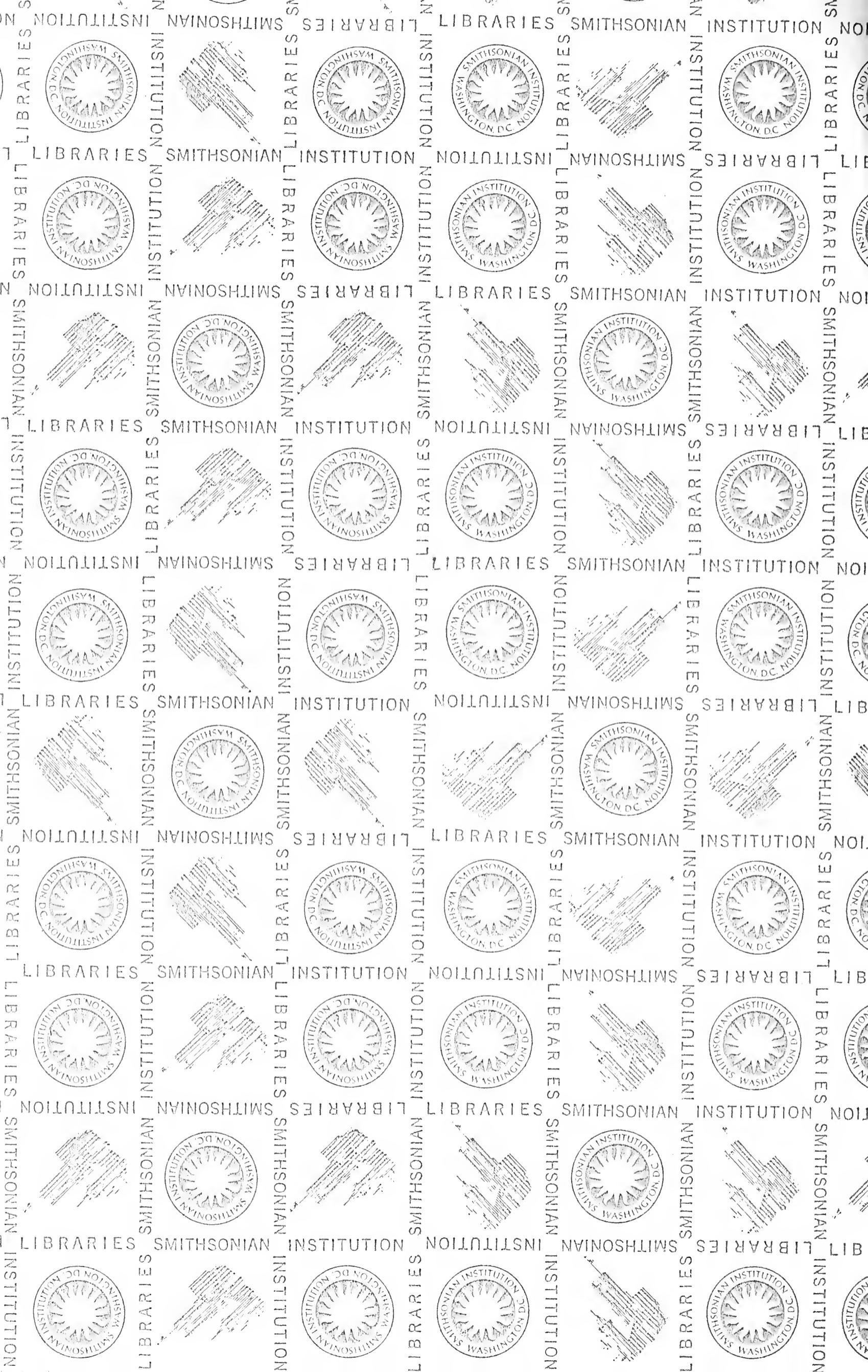
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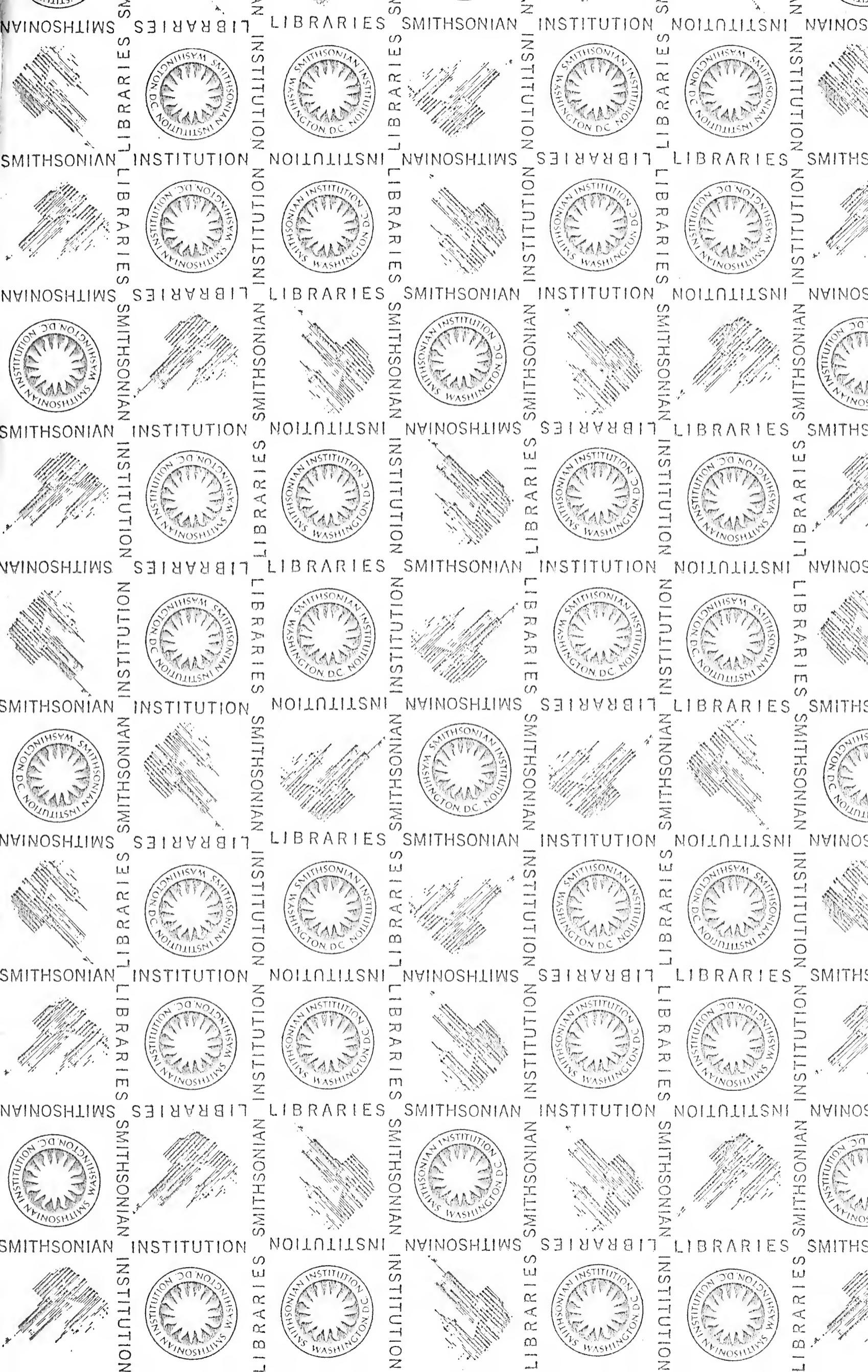
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